ENGINEER'S REPORT
AND
FINAL ENVIRONMENTAL IMPACT REPORT
On
Proposed Flood Control Measures
On
The Palo Alto Flood Basin
Northwest Zone
Project Number 1039

September 1976

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SANTA CLARA VALLEY WATER DISTRICT

ENGINEER'S REPORT
ON
PROPOSED FLOOD CONTROL MEASURES
ON
THE PALO ALTO FLOOD BASIN

NORTHWEST ZONE
PROJECT NUMBER 1039

April 1976
Amended June 8, 1976

Report prepared by Design and Construction Unit Staff

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Santa Clara Valley Water District

5750 ALMADEN EXPRESSWAY
SAN JOSE, CALIFORNIA 95118
TELEPHONE (408) 265-2600

June 8, 1976

Honorable Board of Directors
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, California 95118

Gentlemen:

Transmitted herewith is an amended Engineer's Report on Proposed Flood Control Measures on the Palo Alto Flood Basin, Project Number 1039. This project is within the city limits of Palo Alto in the Northwest Zone (NW-1) of the Santa Clara Valley Water District.

This amended report more completely discusses the potentials of this project for reduction of flooding southwesterly of Bayshore Freeway. It assesses the potentials for damage from flooding in the community, considers the beneficial and adverse impacts which would arise from a flood protection project and alternatives to it and concludes that flood protection should be provided to the area.

The recommended project is the remaining link of completing the levee system around the Palo Alto Flood Basin. It consists of constructing a combination of a levee and a floodwall along a portion of Matadero Creek, around the Palo Alto Municipal Service Center, and along the northeast side of East Bayshore Road. The completed project will help prevent flooding of the highly developed residential and commercial properties southwesterly of Bayshore Freeway from flood waters that can accumulate in the Palo Alto Flood Basin. Estimated cost of the project is $496,000 and can be financed from Northwest Zone tax revenues. The above estimate includes the cost of landscaping the levees with vegetation to reestablish the plant life.

I concur in the project as proposed and recommend that a public hearing be held as a prerequisite to the construction of the project.

Sincerely yours,

John T O'Halloran

John T. O'Halloran
General Manager

Enclosure

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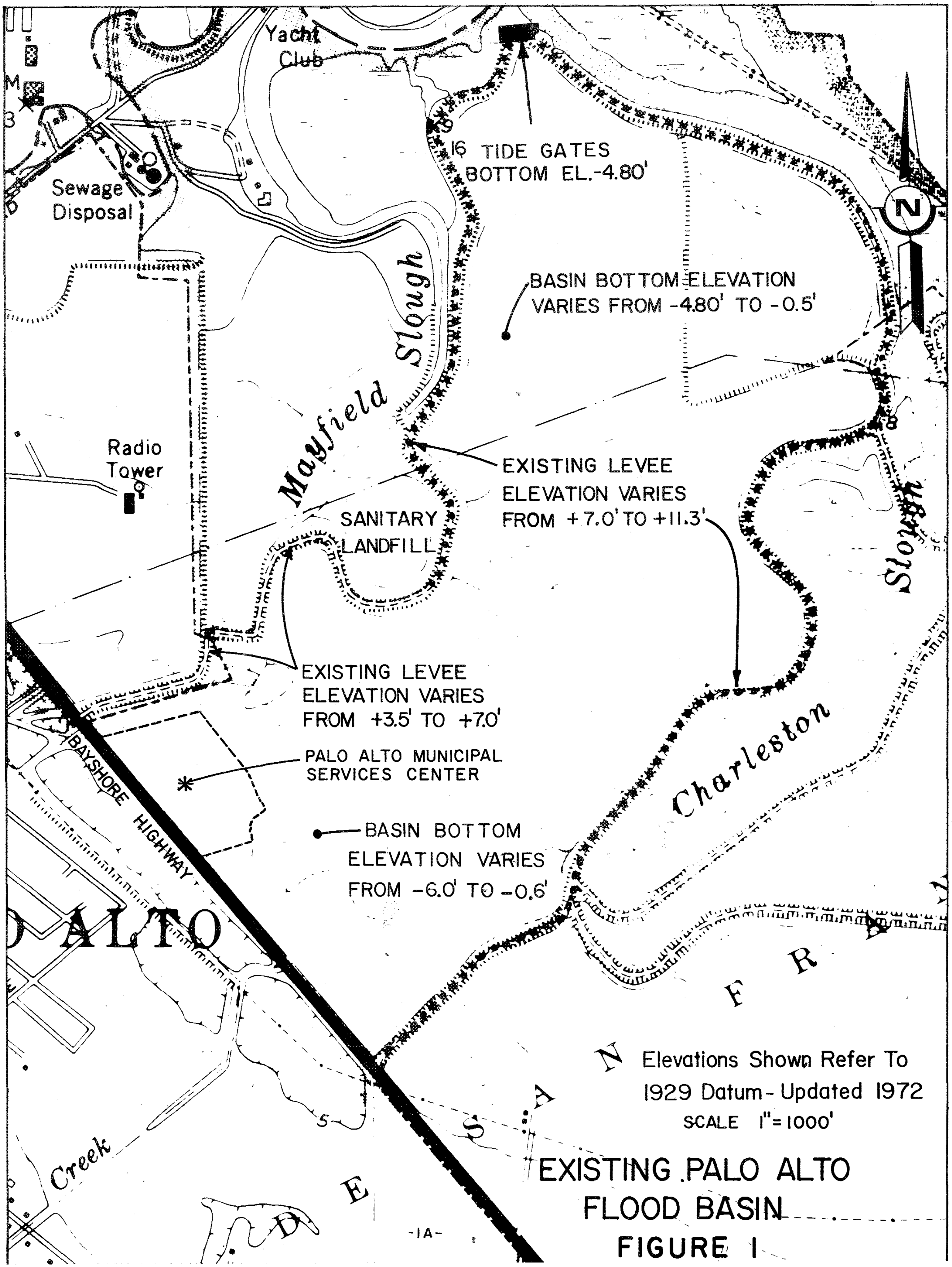
INTRODUCTION

The Palo Alto Flood Basin is located in the Northwest Zone of the Santa Clara Valley Water District. It collects floodwater runoffs from Adobe, Barron and Matadero Creeks. These creeks originate in the foothills of Santa Cruz Mountains and flow generally northward into South San Francisco Bay through the Palo Alto Flood Basin. As the creeks flow in well-defined channels of the valley floors, they pass through highly urbanized areas of the City of Palo Alto, and the Towns of Los Altos Hills and Los Altos, thereby furnishing outfalls for the city storm drainage systems.

These creeks historically discharged directly into South San Francisco Bay through Mayfield and Charleston Sloughs. As the floodwaters combine with the Bay waters, flooding of the lowlands occurred during times of high tide. The flooding was intensified due to ground subsidence, which averaged about 5.5 feet over the years. To prevent this flooding, levees were constructed in the mid-1950's together with 16 tide gates. The levees and the tide gates were constructed to create a flood basin, later named the Palo Alto Flood Basin. The flood basin, as it exists today, contains approximately 600 acres and is shown on Figure 1.

The floodwaters stored in the basin are released to the Bay through the tide gates. The purpose of the tide gates is to regulate flows through the basin. When the water surface elevation in the basin is higher than the tidal elevation of the Bay, the


Yacht Club
16 TIDE GATES
BOTTOM EL.-4.80'
Sewage Disposal
BASIN BOTTOM ELEVATION VARIES FROM -4.80' TO -0.5'
N
Mayfield Slough
Radio Tower
EXISTING LEVEE ELEVATION VARIES FROM +7.0' TO +11.3'
SANITARY LANDFILL
Slough
EXISTING LEVEE ELEVATION VARIES FROM +3.5' TO +7.0'
PALO ALTO MUNICIPAL SERVICES CENTER
BAYSHORE HIGHWAY
Charleston
BASIN BOTTOM ELEVATION VARIES FROM -6.0' TO -0.6'
O ALTO
S A N F R A
D E
Creek
5

Elevations Shown Refer To
1929 Datum - Updated 1972
SCALE 1"=1000'

EXISTING PALO ALTO
FLOOD BASIN
FIGURE 1

gates open automatically and discharge from the basin to the Bay. When the tidal elevation of the Bay is higher than the water stored in the basin, the gates close and prevent Bay waters from entering into the flood basin.

Over the years, as the ground subsidence continued, the levees around the flood basin as well as along Adobe, Barron and Matadero Creeks just upstream of Bayshore Freeway (U.S. 101) were no longer adequate to prevent flooding of the residential, commercial and industrial development southwesterly of Bayshore Freeway. Hence, in 1964, the Santa Clara County Flood Control and Water District, now called the Santa Clara Valley Water District, undertook a study to investigate the alternative methods by which flood protection could be provided to the adjacent community. In the study, two methods were investigated. They are:

1. The use of the high-leveed channels open directly to the Bay without the benefit of a flood basin; and

2. The use of the flood basin modified to provide the necessary storage of the upstream runoffs during the rising tide and high tide periods of the Bay for discharging later into the Bay during the falling and low tide periods.

A detailed analysis of the study is the subject of a report titled "Report on Outfall Channels for Matadero, Adobe, and Barron Creeks", Santa Clara County Flood Control and Water District, July 1964. The study concluded that the flood basin alternative was far superior to the alternative of constructing the high-leveed channels, both economically and environmentally. In addition to providing the needed flood protection, the flood basin alternative allowed lower levees for the upstream channels due to lower water surface elevations in the basin. This alternative also provides an attractive site for the conservation of wildlife and its natural habitat. The lower water surface elevations also provide an additional benefit of requiring less pumping of local drainage waters (storm sewer runoffs) into the flood control channels.

A construction program was started by the Water District and it continued as funds became available for the flood control work. The construction began in 1968. The first stage construction was completed in 1970 when the perimeter levees were constructed from East Bayshore Road on the Adobe-Barron Creek side to a point approximately 1900 feet east of East Bayshore Road on the Matadero Creek side. The second stage construction was completed in 1972 when a combination of floodwalls and levees were constructed on Matadero Creek from just upstream of Bayshore Freeway (U.S. 101) to Louis Road. The third stage construction was completed in 1974 when levees and floodwalls were constructed on Adobe and Barron Creeks from Bayshore Freeway to just downstream of Louis Road. The fourth stage construction, which is the subject of this report, is proposed to be constructed assuming this report and the environmental impact report are approved and certified. The project consists of completing the perimeter levee system around the Palo Alto Flood Basin. The specific details of the fourth stage construction will be discussed later under the section "Project Description". The final stage of construction, as originally conceived, was to excavate the 440 acres of the basin floor to

3.5 feet below mean sea level and to use this material to fill an area of approximately 100 acres adjacent to East Bayshore Road for a potential commercial and industrial development. But in the spring of 1973, the City of Palo Alto, as part of its General Plan, Open Space Element, designated the entire 600-acre flood basin as a Wetland Preserve. Hence, in 1974, the Santa Clara Valley Water District reevaluated the need for excavating the basin floor. The conclusion of this evaluation was that no excavation of the basin floor was needed for flood control purposes if the entire 600-acre flood basin was available for storing the peak runoffs. However, the study confirmed the need for completing the levees around the flood basin as the first step toward preventing flooding of the residential and commercial development southwesterly of Bayshore Freeway from waters that can accumulate in the flood basin when all of the design flows from Adobe, Barron and Matadero Creeks can get into the flood basin. The study results are discussed in detail in the report titled "Storage Capability of the Palo Alto Flood Basin", Santa Clara Valley Water District, March 1974.

Meetings were held beginning in December, 1973 with the City of Palo Alto and the Palo Alto Citizens Study Committee to discuss their desires relative to flood control measures that would provide the needed flood protection and preserve the flood basin in its near natural state.

This report discusses the proposed project that grew out of these meetings and presents the following:

1. A general description of the tributary creek watersheds.

2. A description of the Palo Alto Flood Basin.

3. A general description of the flooding problem.

4. A discussion of alternatives investigated.

5. A description of the proposed project together with plans delineating specific construction features.

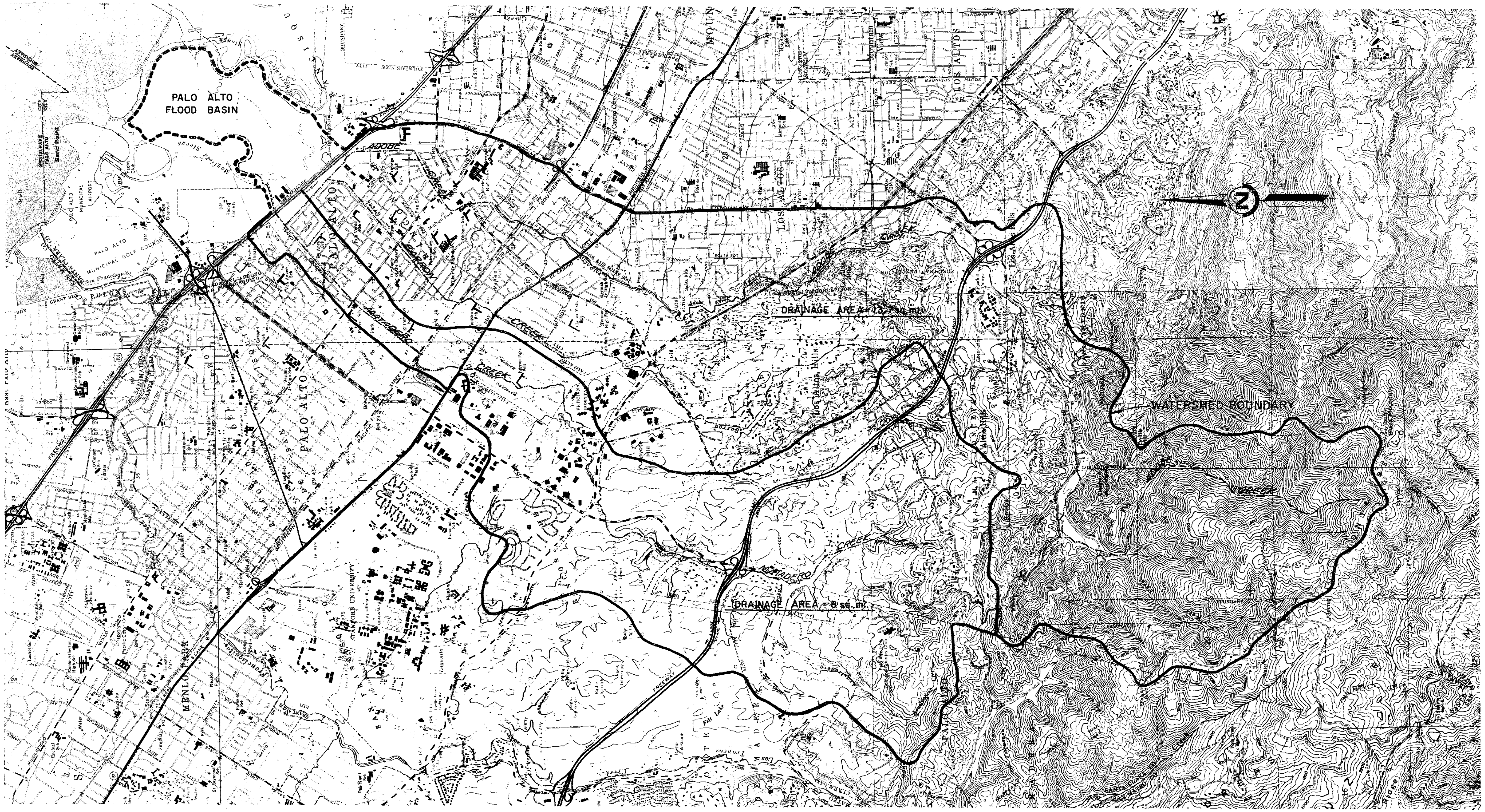
6. An estimate of the costs of the proposed project and the means of financing it.

DESCRIPTION OF TRIBUTARY CREEK WATERSHEDS

There are three major creek watersheds which contribute floodwater runoff to the Palo Alto Flood Basin. They are:

1. Adobe Creek
2. Barron Creek
3. Matadero Creek

The elevations of the watersheds range from slightly above mean sea level in the valley floor to about 2000 feet above mean sea level in the mountainous regions. The total drainage area of the watersheds is 21.7 square miles. Of this area, approximately 9 square miles are hill lands and the balance is in the relatively flat valley floor. All three watersheds are located within the boundaries of Santa Clara County. They are bounded by the San Francisquito Creek basin on the west side, the Santa Cruz Mountains on the south side, the Permanente Creek basin on the east side and the San Francisco Bay on the north side. Figure 2 shows a map of the combined creek watersheds and illustrates the general topography of the areas. Most of the hill lands are characteristically brushy woodlands. However, there is some development consisting of streets and private residential homes. The gentle sloping valley floors of the watersheds are highly developed into residential, commercial and industrial uses. The area has a relatively mild climate. Temperatures range from an average high of about 80 degrees during July to an average low of about 40 degrees in January. The hill lands of the watershed areas have a mean annual precipitation of approximately 32 inches and the valley floor about 14 inches. Approximately 90 percent of the rainfall occurs



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REV.	DESCRIPTION	SUB.	APPR.

REFERENCE INFORMATION AND NOTES

DATE	2-24-76
DESIGN	G. KAWAOKA
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Santa Clara Valley Water District

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DIVISION ENGINEER R.C.E. NO. 15851

ENGINEERING APPROVAL
Edwin Ferguson
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FIG-2
PALO ALTO FLOOD BASIN WATERSHED

SCALE
1" = 2000'

in the late fall and winter months. January is usually the month with the most rainfall. Occasional thunderstorms do occur during the summer months. However, they do not contribute significantly to the annual precipitation. The steep nature of the upper portions of the watershed results in short duration, high intensity runoffs for most of the major storms. After each major runoff, low flow continues in the creeks for several weeks as water temporarily stored in the natural storages of the watersheds is returned to the creeks. Although the streams are usually dry during the summer months thereby reducing the fish life, they support various animal life that can find water elsewhere during the dry months. The lower reaches of these creeks were reconstructed to minimize bank erosion and to provide needed flow carrying capacity during flood periods.

DESCRIPTION OF PALO ALTO FLOOD BASIN

The Palo Alto Flood Basin is located in the City of Palo Alto, County of Santa Clara. The flood basin is bounded on the north by the IT&T Communication Center and the City of Palo Alto refuse disposal area, on the east by San Francisco Bay, on the south by a light industrial complex, and on the west by Bayshore Freeway (U.S. 101). The area westerly of Bayshore Freeway is highly developed into residential and commercial uses. The flood basin is relatively flat and mostly below 0.6 feet below mean sea level, with levees varying in elevation from a low of about one foot to a high of about 11.3 feet above mean sea level. The flood basin is one of the few remaining wetlands in the San Francisco Bay area which is relatively undisturbed. Its 600-acre area provides a permanent habitat and nesting area for a number of species of birds and mammals. It also provides a wintering ground for numerous migratory birds which complement the adjoining tidal marsh plant community.

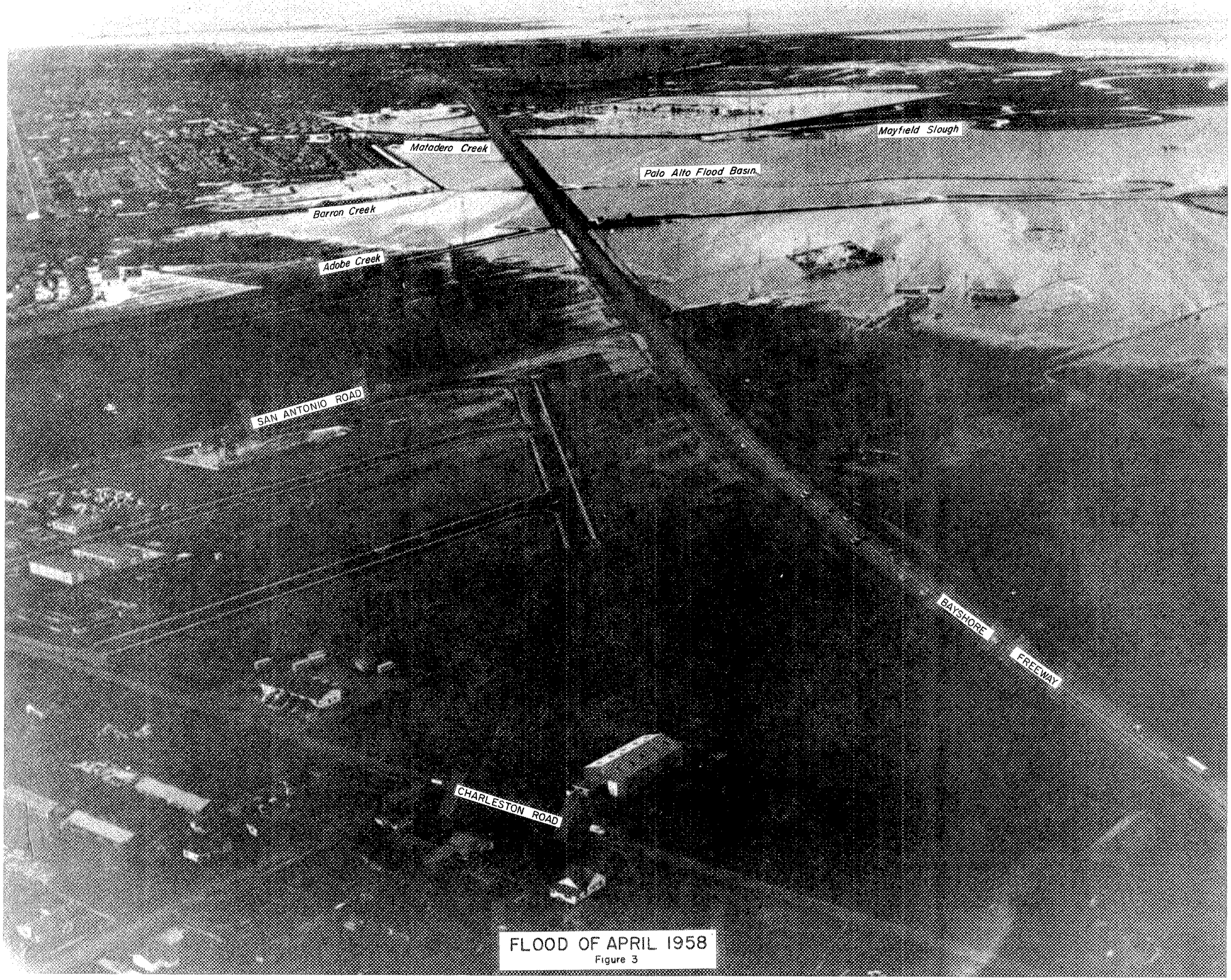
DESCRIPTION OF FLOODING PROBLEM

This section of the report will discuss the limits of the historic flooding caused by the combined flows from Adobe, Barron, Matadero and San Francisquito Creeks. The report will also describe the limits of flooding during the design flood and the potential damages to the urban development if the remaining levees around the flood basin are not completed.

Limits of Historic Flood

Although in the past numerous instances of flooding have occurred in the vicinity of the Palo Alto Flood Basin, there have been no documents which separate the flooding limits from Adobe, Barron, Matadero and San Francisquito Creeks. During the major floods of February 1940, December 1955, and April 1958, floodwaters which escaped from San Francisquito Creek combined with those of Adobe, Barron and Matadero Creeks causing inundation of the residential, business and commercial properties adjacent to Bayshore Freeway. Figure 3 shows flooding that occurred during the April 1958 flood.

February 1940 Flood - During this flood the damage was caused mostly to the agricultural lands upstream and downstream of Bayshore Bypass, now called Bayshore Freeway. Inundation was the result of overbank flows from San Francisquito and Matadero Creeks. Damages were relatively light as compared to the floods of 1955 and 1958, because the primary land use at that time was agricultural.



FLOOD OF APRIL 1958
Figure 3

December 1955 Flood - A heavy storm, accompanied by near hurricane winds, struck the creek watersheds causing high flows in the channels. Debris was accumulated in the bridges of Bayshore Freeway which caused overbank flows near the Freeway. The water flowed into the residential subdivision and reached a depth of up to three feet above the floors of some homes. The depths observed above the Freeway were about 3 inches near Matadero Creek to about ten inches near San Francisquito Creek. For this reason, the Freeway was closed for several hours. Extensive damage was caused to homes, furnishings and to the commercial properties.

April 1958 Flood - The major flooding was caused by a break in the south levee of San Francisquito Creek. The water flowed south and combined with that of Matadero Creek causing inundation of a major portion of the Palo Alto municipal property. Although only minor damage occurred upstream of Bayshore Freeway, several aircraft were damaged at the Palo Alto Municipal Airport downstream of the Freeway and a portion of the runway destroyed due to uneven settlement.

Limits of Design Flood

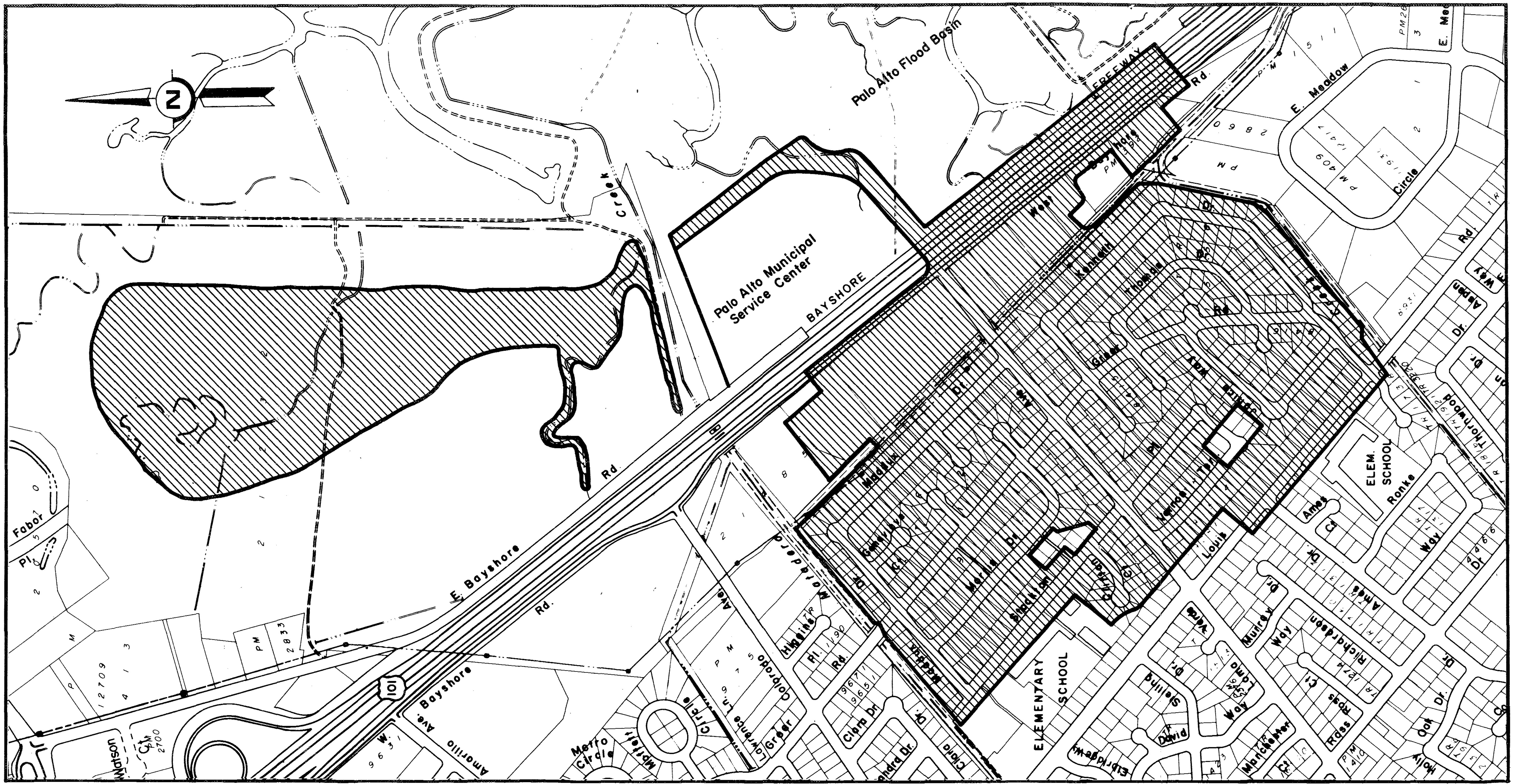
The proposed flood control project has been designed to provide adequate capacity, plus freeboard, in the flood basin to store runoffs from the design flood. The design flood is the "1% flood" and is that flow of water from a drainage area that has a one percent chance (probability of 0.01) of occurring in any given year. It is equivalent to the so-called 100-year flood, but it should not be thought of as an event that occurs regularly every 100th year. Instead, it is the flood flow event that would be equaled or exceeded about 100 times in 10,000 years. It is also possible that two repetitions of this flood flow could occur in a single year, or that a single event may not occur even once in 200 years. The 1% discharge is determined by a statistical method based on historic record. For the Palo Alto Flood Basin, the design discharge is 5050 cubic feet per second (cfs). In comparison, the historic floods described above were about one-half this size and severity.

A computer program was used to determine the height of the levees which would provide the needed storage capacity in the flood basin. With the help of this computer program, relationships between such parameters as inflow into the flood basin, storage volume, basin pool elevation, discharge through tide gates, and tide cycle were established. The tide cycle was developed by analyzing the average four-day winter tides recorded at the South Bay No. 1 tide gage for the months of December, January, and February during 1967 through 1972. This tide cycle was adjusted to reflect the tide cycle near Palo Alto by using the Army Corps of Engineers' "Tidal Reference Planes" chart. The resulting tide cycle was used in conjunction with the inflow hydrograph and the most critical combination of hydrologic events was established. From the analysis, it was found that the flood basin would require a total capacity of approximately 3596 acre-feet to store waters from a design flood. The existing capacity of the basin is approximately 3000 acre-feet with no freeboard. This would mean that about 596 acre-feet of the flood waters would escape from the flood basin and cause inundation of the surrounding area. Since the existing levees along the west side of the flood basin are the lowest in elevation relative to others, flooding would begin from the west end and increase as the water level in the basin rises above Bayshore Freeway.

"Figure 4" shows the area that will be protected from flooding from waters accumulating in the Palo Alto Flood Basin if the proposed project is constructed and when all of the design flows from Adobe, Barron and Matadero Creeks can get into the flood basin. The developed area bounded by Matadero Creek, Bayshore Freeway, Adobe Creek and Louis Road will still be subject to flooding from waters originating in Adobe, Barron and Matadero Creeks. For this discussion, the above area will be referred to as the "developed area". Many of the culverts between Louis Road and Alma Street on these three creeks are too small to carry the flood flows. Water builds up at the entrance to the culverts and spills over the streets and flows down into the developed area. Water from San Francisquito Creek is prevented from getting into the developed area by Matadero Creek.

The Palo Alto Flood Hazard Map prepared by the U.S. Department of Housing and Urban Development shows the areas in Palo Alto that will be flooded from a 1% flood from all of the existing sources of flooding. This map can be considered the "existing flood map". Copies are available at the City of Palo Alto Planning Department and at the Water District office. The Palo Alto Flood Hazard Map is used by HUD to show what areas need flood insurance.

Flooding will be reduced in the developed area when the flood basin project is completed but will not be eliminated until additional capacity is provided in the Adobe, Barron and Matadero Creeks. The District is currently studying possible alternatives for these creeks.



▨ APPROXIMATE LIMITS OF 100-YEAR FLOOD INUNDATION (BASED ON 1973 CONDITIONS) THAT WILL BE PROTECTED FROM FLOODING AS A RESULT OF THE PROPOSED PROJECT FROM FLOOD WATERS THAT CAN ACCUMULATE IN THE FLOOD BASIN WHEN ALL OF THE DESIGN FLOWS FROM ADOBE, BARRON AND MATADERO CREEKS CAN GET INTO THE FLOOD BASIN

FIGURE 4

PALO ALTO FLOOD BASIN
1 % FLOODING MAP

Although the Palo Alto Municipal Services Center (MSC) is just barely high enough to escape flooding from the design flood, the low flood walls proposed for three sides of the MSC will provide freeboard protection for the MSC. When the work proposed in this report is completed, the level of flood protection will be uniform along the entire perimeter of the basin.

The overland flow from the design flood would probably cover an area of approximately 176 acres. The estimated depths of water will vary from a few inches near Louis Road to approximately 2-1/2 feet near Bayshore Freeway. Approximately 460 residential and commercial units would probably be subject to flooding. Also, several major public facilities, such as roads, bridges, sewer lines, gas, electric and water lines would probably be damaged. Although some flooding can be expected to occur from the north side of the Palo Alto Flood Basin levees (Matadero Creek side) from San Francisquito Creek, the property damage would be minor since the developed areas are above high water.

ALTERNATIVES

Although there are many flood prevention methods available to protect the public from flood damages, the potential alternatives applicable to a given project are greatly reduced by physical and environmental controls, by the economical aspects of the flooding problem, by the financial limitations of the governing agency, by the social attitudes of the community, and by the political attitudes of the governing agency.

In the case of the Palo Alto Flood Basin, these factors combined to eliminate most of the possible alternatives. Alternatives, such as acquiring more right of way to increase the flood basin area or adding tide gates to the existing system for more discharge to the Bay, were ruled out because the benefits of these methods would be far less than the costs. Increasing the size of the flood basin would not be compatible with the current land use planning for the Bay Front area. Additional flood gates were found to have very little effect in reducing the high water level in the flood basin. Another method considered was to construct the levees from material inside the basin. This method was also ruled out since it would require removing a considerable amount of vegetation which would seriously affect the ecological balance.

From the environmental and the economic points of view, the most favorable alternative is to construct a combination of levees and floodwalls. This method would provide the needed level of flood protection and preserve the flood basin in its existing state. Several types of flood barriers and alignments were considered. These designs were described in a brochure prepared by the Water District. The designs were presented to the City of Palo Alto staff and the Palo Alto Citizens Study Committee for their review and comments. Meetings were held to discuss the merits of each of the design alternatives. It was concluded from these meetings that the most desirable design was to raise the existing levees, using imported fill material, and to construct a floodwall on top of the new levees. The alignment of the flood barrier would be along the Matadero Creek levee, along three sides of the Palo Alto Municipal Service Center (a masonry wall on its northerly side) and along East Bayshore Road. This design would also provide an area for parking along East Bayshore Road and would allow for control of vehicular access to the flood basin as desired by the City of Palo Alto. One disadvantage of this design is the height of the flood barrier along East Bayshore Road. Due to the undulating conditions of the existing road and the need to have the top of the floodwall at a constant elevation, the wall would partially block motorist's views of the flood basin when they are traveling by. An alternative to the floodwall along East Bayshore Road is to raise East Bayshore Road to an elevation which would provide the same level of flood protection as would be provided by the levees and the floodwalls. Such a design was investigated, and it is described in the following paragraphs.

Raising of East Bayshore Road - To provide the flood protection from a design flood, approximately 2000 feet of East Bayshore Road would have to be modified and raised to elevation +7.0 msl between Adobe Creek and the Palo Alto Municipal Service Center.

The minimum top width of the raised road would have to be approximately 41 feet. This would provide two 11-foot-wide traffic lanes, two 5-foot-wide bicycle lanes, and a 9-foot-wide parking lane adjacent to the flood basin. The road would have to be raised using imported fill material. Fill material would have to be placed approximately 5 feet westerly of the existing 34-inch gas line in order to avoid the relocation of the gas main. The side slope of the raised road would be two horizontal to one vertical (2:1) and it would be landscaped with vegetation to minimize the surface erosion and to improve the aesthetic appearance. The work would have to be done outside of the State's rights of way so that the construction would not interfere with the heavy traffic on Bayshore Freeway. Vertical and horizontal curves would be required at both ends of the raised road to provide smooth approaches to the existing road. Raising of the road would require a new subbase, asphalt concrete pavement, curb, gutter and other related items. It would also require a 2-foot-high guardrail on the flood basin side to protect vehicles from accidentally driving into the flood basin. The guardrail could serve the additional purpose of controlling vehicular access to the flood basin as desired by the City of Palo Alto.

Several major utilities would be affected by this design. They are: a sanitary sewer line, storm sewer line, gas line, electrical line, and water line. Some of these would require minor modifications whereas the others would require a total relocation. Traffic control would also be a major concern. If the road is closed during the construction period, the traffic would have to be diverted to nearby streets. If the road is kept open during the construction period, the work would have to be done in stages. In either case, this design would increase the inconvenience to the public. A turnout at the mid-length of the raised road would provide the desired vehicular access to the flood basin.

Due to the narrow right of way width near the Municipal Service Center, a 4-foot-high floodwall would be required to support the back slope of the elevated road. The floodwall would be approximately 285 feet long and it would have to be placed so that it will not interfere with the 34-inch gas main.

With this design, the motorists will be able to view the flood basin from East Bayshore Road, but not from Bayshore Freeway. The estimated cost for raising East Bayshore Road is $280,000. This estimate is based upon February 1976 prices and it includes the cost of construction, utility relocations, landscaping, engineering, inspection, construction contingencies and traffic handling.

The following table summarizes the results of the above investigation and compares the features of raising East Bayshore Road with those of constructing a combination of a levee and a floodwall along the road.

Table 1

Comparison between Raising East Bayshore Road and Constructing a Combination of a Levee and a Floodwall

Raising East Bayshore Road	Constructing a Levee and a Floodwall along East Bayshore Road
1. The elevation of the top of the road would be 7.0 msl.	1. The elevation of the top of the levee would be 4.0 msl and that of the floodwall 7.0 msl.
2. The top width of the road would be 41 feet; this will allow two 11-foot vehicular lanes, two 5-foot bicycle lanes and one 9-foot parking lane.	2. Will not change the existing road condition. The floodwall will be constructed approximately 42 feet east of the existing curb. This will clear PG&E's easement which is necessary for the maintenance of their 34-inch gas main. This design will allow a strip approximately 33 feet wide for parking and for landscaping.
3. The length of the road to be modified would be 2000± feet.	3. The length of the levee and the floodwall will be approximately 1850 feet.
4. The side slope of the shoulder for the road would be 2:1 and it would be landscaped with vegetation.	4. The side slope of the levee will be 3:1 on the basin side and a flatter slope on the road side. The slope on basin side will be landscaped as needed with vegetation.
5. Would not disturb the existing vegetation on the flood basin bank since the fill work would be done outside the basin.	5. Will disturb the existing vegetation on the bank at several locations when the fill is placed.
6. Will require guard rails to protect vehicles from falling into the flood basin and to control vehicular access.	6. Will not require guard rails. The floodwall will control vehicular access to the flood basin.

Table 1 (continued)

Raising East Bayshore Road	Constructing a Levee and a Floodwall along East Bayshore Road
7. Would allow motorists' view of the flood basin from the road but not from Bayshore Freeway.	7. Will not allow motorists' view of the flood basin from the road nor from Bayshore Freeway.
8. Would reduce some Freeway noise level inside the flood basin.	8. Will reduce noise level from Freeway and East Bayshore Road inside the flood basin.
9. Would require removal and replacement of pavement, curb, gutter, and other related items; and the construction of a 4-foot-high floodwall, approximately 285 feet long. The trees along the roadside will have to be removed.	9. The levees and the floodwalls will clear the existing trees along the roadside and hence will not require their removal.
10. Would require major utility relocations such as electroliers, electrical lines, sewer lines, water lines and gas line.	10. Will not disturb the existing utilities. Only minor adjustments will be made to the storm sewer outfalls.
11. Would require traffic diversion or detouring during the construction period. This will increase inconvenience to the public.	11. Will have very insignificant effect on the traffic conditions during the construction period.
12. Will cost approximately $280,000 excluding the rights of way.	12. Will cost approximately $116,000 excluding the rights of way.

Considering the best combination of advantages and disadvantages of the above two designs, the design with a combination of a levee and a floodwall would be the least expensive and the most desirable from an environmental viewpoint. In addition to providing the needed flood protection, this design will provide a wider parking strip (12 feet wide) and enough room for landscaping in front of the floodwall. It will also allow the City of Palo Alto to build a bicycle path along the front of the floodwall.

DESIGN CRITERIA

The criteria used in the design of the proposed project for the Palo Alto Flood Basin follow accepted engineering standards. The economic evaluations of the alternative designs were based on estimates of construction costs, engineering and inspection costs, the costs of rights of way (where applicable), landscaping, and utility relocations, and the present worth of future maintenance costs.

All alternative designs were evaluated on the basis that the flood basin would provide sufficient storing capacity to safely convey the one percent discharge from Adobe, Barron and Matadero Creeks to a point of disposal. The design flows meeting this standard were calculated using the results of a regional flood frequency analysis for the three tributary creek watersheds which drain into the Palo Alto Flood Basin. This multiple regression analysis was used to determine the peak discharge in accordance with the watershed area, the mean annual precipitation, and the watershed basin shape. The data were adjusted to reflect minor increases in the development of the tributary creek watersheds which generally results in increased runoff during storms. The design flood flows and volumes thus obtained for the individual creek watersheds are listed on Table 2. The table also shows the combined flows resulting from Adobe, Barron and Matadero Creeks into the flood basin.

Table 2

Design Flood Flows and Volumes
100-Year Recurrence Frequency

Creek	Peak Flow Rate (cubic feet per second)	48-Hour Flood Volume (acre-feet)
Matadero Creek at Bayshore Freeway	2000	2400
Adobe and Barron Creeks at Bayshore Freeway	3550	4500
Adobe, Barron and Matadero Creeks into Palo Alto Flood Basin	5050	6575

As stated earlier, the elevation of the top of the flood barrier was determined from the relationships considering the inflow into the flood basin, the storage volume, the basin pool elevation, the discharge through the tide gates, and the tidal cycle. The elevation of the top of the flood barrier thus determined was 7.0 feet above mean sea level, including the freeboard. Consideration was also given regarding the City of Palo Alto's request of providing an area for parking along East Bayshore Road and controlling vehicular access to the flood basin.

DESCRIPTION OF THE PROJECT

The proposed project consists of widening and raising the existing levees and constructing the floodwalls on top of the new levees to elevation +7.0. Figure 5 shows a general plan of the proposed project. The completed project will provide the desired level of flood protection during the design flood. For simplicity of describing the project it is divided into three segments.

Segment 1 - Levee and a floodwall along the northwesterly side of Matadero Creek.

Segment 2 - Levee and a floodwall around three sides of the Palo Alto Municipal Service Center.

Segment 3 - Levee and a floodwall along East Bayshore Road.

Segment 1 (Sheets 2 and 3) - This segment of the proposed project is approximately 4062 feet long and extends from East Bayshore Road to the west end of the previously constructed Matadero Creek levee (Station 9+00 to Station 49+62). The work consists of widening the existing top of the levees and constructing a 2-foot-high floodwall to a top elevation of +7.0 msl. The levees will be graded to elevation +5.0 to maintain a uniform floodwall height for easier construction and economy. Only the portions of the existing levees below elevation +5.0 will have to be raised. No floodwall will be needed between Station 9+00 and Station 14+00 because the existing levees are above elevation +7.0.

The project was carefully planned to minimize the damage to the existing vegetation inside the flood basin. Practically all of the fill material will be placed on the northerly slope of the existing levees with the exception of approximately 400 feet between Station 19+00 and Station 23+00 where the fill material will be placed on the southerly slope of the levee bank. The reason for this is to preserve the extensive growth of pickleweed just outside of the flood basin. In the area where the sanitary landfill exists, the levees will be widened on the flood basin side to provide the required width of the maintenance road.

The proposed levee will be 22 feet wide at the top having a side slope of 3 horizontal to 1 vertical (3:1). Imported fill material will be used to construct the levee. The source of the material will be outside of the flood basin and the project limits. The imported fill material will be hauled to the job site, spread and compacted and any excess material will be removed from the project site.

The side channel ditch, just north of the existing levee near East Bayshore Road, will be filled and reconstructed if necessary, when the levee is constructed. The height of the levee will vary from 0 to 1-1/2 feet above the existing levee.

For a distance of about 20 feet, east and west of Station 18+72, the levee side slope will be adjusted to clear the existing water pump so that the pump will not have to be relocated.

A floodwall will be constructed on top of the raised levee. The floodwall will be 2 feet high and will be placed approximately 5 feet north of the southerly edge of the levee leaving a 17-foot-wide maintenance road not subject to flooding.

The top of the levee will be graded to slope away from the flood basin to minimize the leaching effect from the sanitary landfill.

Construction of the levee and floodwall will require an easement varying in width from 240 feet to 70 feet between Station 9+00 and Station 22+20 and from 90 feet to 40 feet between Station 22+20 and Station 49+62. The total area required is approximately 8.6 acres. Also, temporary construction areas will be provided for the construction of the levee and the floodwall. They are shown on the plan sheets. These areas are located in places where there would be minimum damage to the existing vegetation during the construction period.

Segment 2 (Sheet 4) - This segment is approximately 2580 feet long (Station 110+00 to Station 135+80). It runs along three sides of the City of Palo Alto Municipal Service Center (MSC). The work consists of:

1. Constructing a masonry wall along the northerly side of the MSC, from Station 110+50 to Station 118+00.

2. Constructing a combination of a levee and a floodwall along the easterly and the southerly sides of the MSC from Station 118+00 to Station 135+80.

The alignment of the masonry wall was selected to avoid removal of the existing trees and of the fence on the northerly side of the MSC. From Station 110+50 to Station 113+35, the masonry wall will be constructed on top of the existing curb, approximately 9 feet inside of the MSC's northerly property line. Where the curb ends, the masonry wall will continue along the same alignment until Station 118+00 where it will be terminated. The height of the masonry wall will vary from about 8 inches to about 3 feet. An alternative to the masonry wall could be an earth mound between Station 110+00 and Station 118+00. This alternative will be explored with City of Palo Alto staff personnel when the precise construction drawings are prepared.

The combination of a levee and a floodwall beginning at Station 118+00 will extend for a length of approximately 1780 feet. The existing levees will be raised to elevation +4.0 and a 3-foot high floodwall will be constructed on top of the raised levees. The proposed alignment will provide an area for the future planned expansion of the MSC and will minimize the filling inside the flood basin. The levees will be constructed from imported fill material. They will be 20 feet wide at the top having a side slope of 3:1 on the flood basin side. The side slope toward the MSC will be flatter to provide for drainage. The basin floor will not be excavated. The material needed for the levees will be provided by the contractor from sources outside of the project limits. The height of the raised levees will vary from 0 to 4 feet above the existing ground level.

A floodwall will be placed approximately 5 feet away from the inside edge of the proposed levees. The 15-foot wide levee top on the MSC side of the wall will be used for access to the floodwall for maintenance.

The easement required for this portion of the project will vary in width from 30 feet to 55 feet. The total area required is approximately 1.8 acres. Temporary construction areas will be needed for the construction of the levees and the floodwalls. They are shown on the plan sheets.

Segment 3 (Sheet 5) - This segment of the project extends for a length of about 1968 feet between the south end of the MSC and

Adobe Creek (Station 135+80 to Station 155+48). The work consists of raising the existing levee and constructing a floodwall on top. The alignment of the floodwall was selected such that:

1. It will facilitate a planned parking area by the City of Palo Alto and an additional traffic lane between the floodwall and East Bayshore Road.

2. It will avoid having to remove the trees and relocate the electroliers along the edge of East Bayshore Road.

3. It will clear the PG&E's easement for their existing 34-inch gas main.

Under this segment of the project, the levees will be raised to elevation +4.0 using imported fill material. The side slopes of the proposed levees will be 3:1 on the flood basin side and a flatter slope toward the East Bayshore Road side. The flatter slope is desired by the City of Palo Alto to facilitate future parking. The levee will be 15 feet wide at the top. Of this, 5 feet will be on the east side (basin side) of the floodwall and 10 feet on the west side. The existing vegetation on portions of the flood basin bank will be removed when the levees are raised. However, no excavation of the basin floor will be made. Approximately 0.4 acre of the basin area will be occupied by the back slope of the levees. The height of the levees will vary from 0 to 2-1/2 feet above the existing levee tops along East Bayshore Road.

The floodwall will be 3 feet high and be approximately 42 feet easterly of the curb on East Bayshore Road. The floodwall will extend for the entire length of the levees except for 20 feet

(Station 146+63 to Station 146+83) where it will be discontinued to make room for a levee and traffic barriers which will provide controlled vehicular access to the flood basin.

The levee and floodwall will require a 33-foot-wide easement adjacent to East Bayshore Road. The easement will cover an area of approximately 1.6 acres.

Temporary construction areas will be provided on top of the existing levees. The maintenance, if needed, will be done from outside the floodwall.

In addition to the above work, minor modifications will be made to the existing fences, drainage structures and outfalls.

Approximately 30,000 cubic yards of imported fill material will be required for the construction of the levees for the entire project (Segments 1, 2 and 3).

The Contract Specifications for the flood control work will specify abatement of noise, dust, gaseous emissions, chemical materials, water pollution, air pollution, and spillage and will further specify preservation of all vegetation that does not have to be removed. These Specifications will be enforced rigidly. The Contractor will be required to carry out his operation in a manner that will minimize the disturbance to the wildlife, especially during the nesting season.

PROPOSED LANDSCAPE IMPROVEMENT

In order to reestablish damaged habitat and food resource, to mitigate aesthetic obstructions, to provide for recreational potential, and to enhance the environmental quality of the project area, the landscape design and development will include several elements.

Floodwall Treatment - The floodwall will be sandblasted or water washed to remove the cement surface and to expose the underlying aggregate, giving the wall a weathered appearance. The cap or top of the wall will be concrete, preformed or cast in place, of a shape to accommodate leaning on, sitting on, and climbing over; and will give the wall a finished architectural feature. The cap will also be lightly sandblasted.

Earth Forms - Mounding will be developed to minimize the harsh appearance of the straight wall. These mounds will be a combination of mounds some of which will be near the frontage road while some actually abut the wall. The earth mounds will be designed to allow the City of Palo Alto to provide several parking stalls (20) and a bicycle path. The bicycle path is tentatively planned, by the City of Palo Alto, to meander between the mounds developing access points at the wall alternately with access at the frontage road.

Barriers - Traffic barriers will be installed to prevent motorized vehicles from entering the flood basin except for emergencies, access will be controlled by the City of Palo Alto. Chain link gates will not be used.

Plant Material - The plant material to be installed will be native, indigenous to the Santa Clara Valley, and capable of withstanding the conditions of wind, occasional drought, salinity, and poor soil present on the site. A constant food source will be provided by the landscape material to cooperate with the native species of animal and bird life. Road side aesthetics will be enhanced by a choice of plant material which will include deciduous, evergreen, flowering, and fragrant species. The selection of plant materials will be guided by the publication"Palo Alto Baylands Master Plant List" prepared by the Palo Alto Baylands Landscape Consultant, Helen Norman Proctor, Landscape Architect, dated Jaunary 17, 1973. The list of plants may include but not be limited to those in the following chart.

Trees

Alnus oregona
Salix lasiandra
Fraxinus latifolia
Acer negundo

Shrubs

Atriplex lentiformis
Baccharis pilularis
Artemisia douglasiana
Lupinus albifrons var. collinus
Rosa californica

Groundcover

Baccharis "Twin Peaks"
Lippia nodiflora var. rosea

(hydroseeded)

Eriogonum fasciculatum
Coreopsis maritimus
Lamonium vulgaris
Viguiera lacineata
Achillea millefolium
Armeria maritima

Waterline Plants

Heleocharis macrostochys
Grindelia humulis

PROJECT COSTS AND FINANCING

The estimated construction cost of the proposed project is based on February 1976 prices. Contingency items are estimated to account for the costs of engineering, construction inspection, advertising, legal fees, and construction contingencies. The estimated costs are presented in Table 3.

Table 3

Estimated Project Costs
(February 1976 Prices)

Segment	Limits	Construction including Landscaping	Engineering & Inspection at 20%	R/W	Total
1	Station 9+00 to Station 49+62	$125,000	$25,000	$100,000	$250,000
2	Station 110+00 to Station 135+80	83,000	16,600	15,000	114,600
3	Station 135+80 to Station 155+48	97,000	19,400	15,000	131,400
	TOTAL	$305,000	$61,000	$130,000	$496,000

The financing of the proposed project will be entirely from the ad valorem property taxes in the Northwest Flood Control Zone of the Santa Clara Valley Water District.

CONCLUSIONS AND RECOMMENDATIONS

This report has discussed the extent of the flood hazard existing in the areas adjacent to Bayshore Freeway due to the inadequate capacity of the existing Palo Alto Flood Basin. Approximately 460 residential and commercial properties, and several public facilities, such as, parks, streets, bridges, and utilities, will be subject to flooding during the design flood. Damage to these facilities will vary in degree.

Assessment of these potentials for damage, along with consideration of beneficial and adverse impacts identified in the project environmental impact report, leads to the conclusion that flood protection works should be provided to the area.

The proposed project will provide flood protection from waters that can accumulate in the Palo Alto Flood Basin when all of the design flows from Adobe, Barron and Matadero Creeks can get into the flood basin. It is the most desirable solution both economically and evironmentally. Besides offering the flood control benefits, it will preserve the flood basin in its near natural state.

The proposed flood protection work will consist of widening and raising of the existing levees and constructing floodwalls on top of the raised levees to elevation +7.0 along Matadero Creek, around three sides of the Palo Alto Municipal Service Center, and along East Bayshore Road. The construction of the levee and the floodwall along East Bayshore Road will provide an area for parking and for landscaping and will allow control of the vehicular access to the flood basin as desired by the City of Palo Alto. It will also reduce the Freeway and the East Bayshore Road traffic noise level inside the flood basin.

The total estimated cost for the proposed project is $496,000. This estimate includes the costs of construction, rights of way, landscaping, engineering, and construction inspection.

Based on these conclusions, it is recommended that the flood control measures as described herein be approved and construction be undertaken.

Submitted by:

Bruce Wilson

Bruce Wilson
Division Engineer
Design Division

APPROVAL RECOMMENDED:

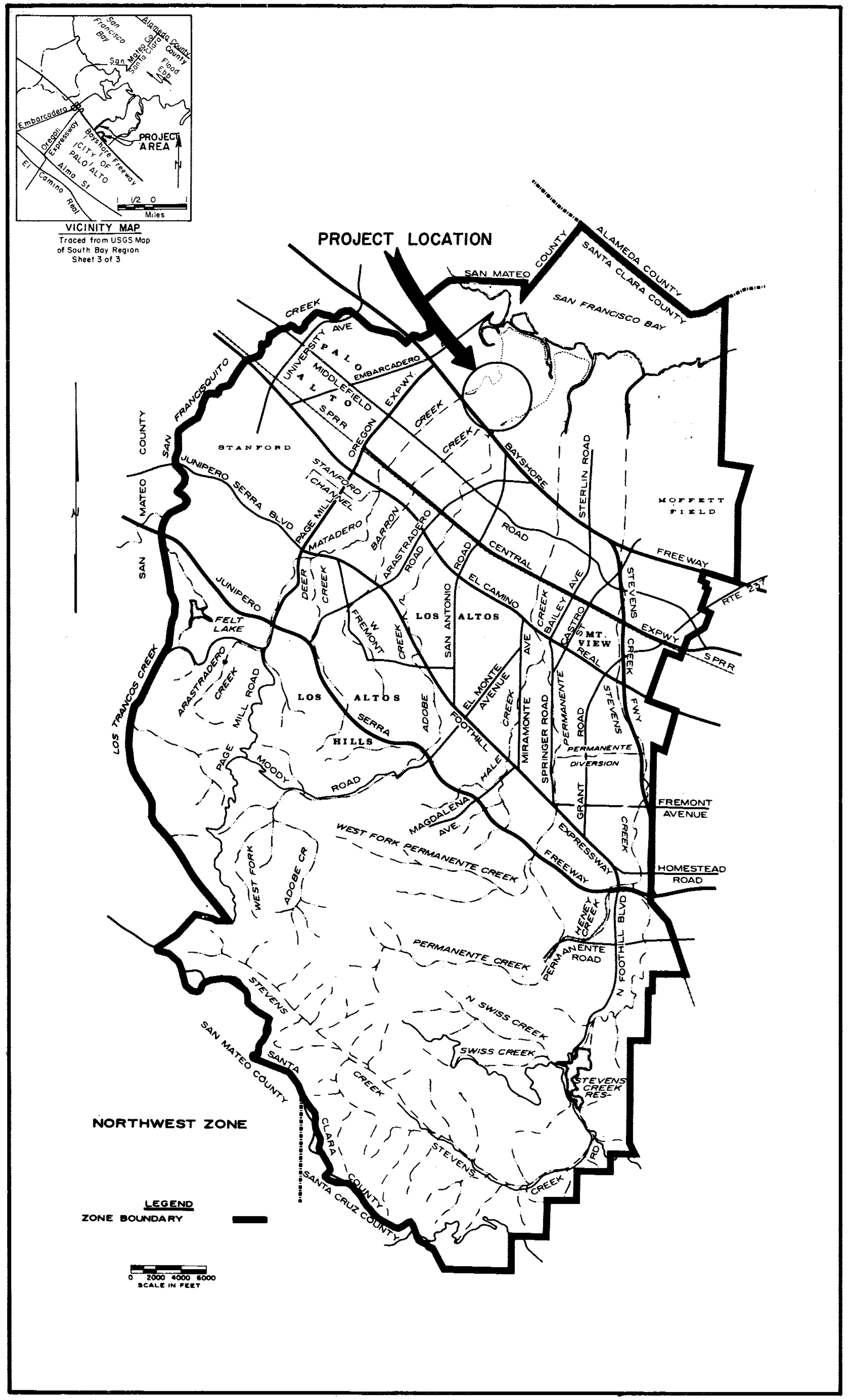
Edwin Ferguson

Edwin Ferguson
Head, Design Branch
Design and Construction

APPROVED:

George Korbay

George Korbay
Design and Construction Manager



MAP AND GENERAL PLAN

FOR

PALO ALTO FLOOD BASIN

Santa Clara Valley Water District

NORTHWEST FLOOD CONTROL ZONE

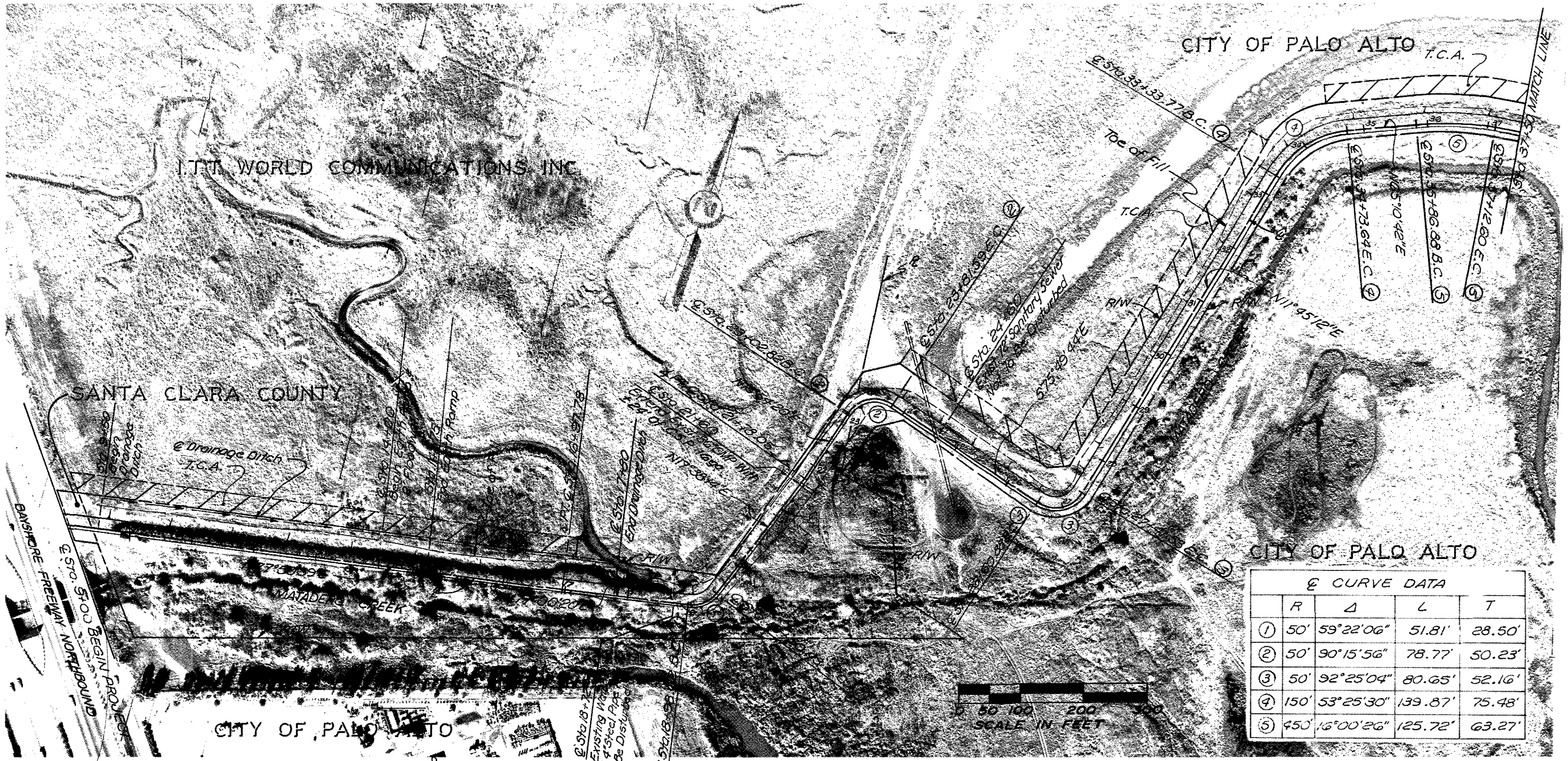
PROJECT NO. 1039

PROJECT APPROVAL:

George Kerbay
DESIGN AND CONSTRUCTION MANAGER

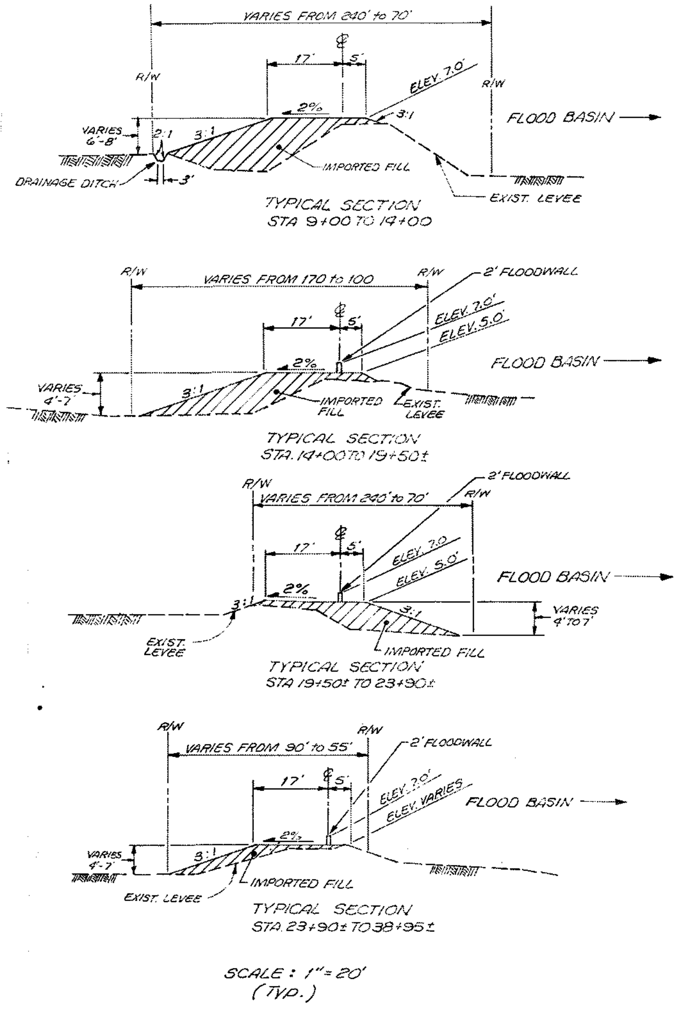
Lloyd C Fowler
CHIEF ENGINEER

DATE: 12 April '76



℄ CURVE DATA

	R	Δ	L	T
①	50'	59°22'06"	51.81'	28.50'
②	50'	90°15'56"	78.77'	50.23'
③	50'	92°25'04"	80.65'	52.16'
④	150'	53°25'30"	139.87'	75.48'
⑤	450'	16°00'26"	125.72'	63.27'



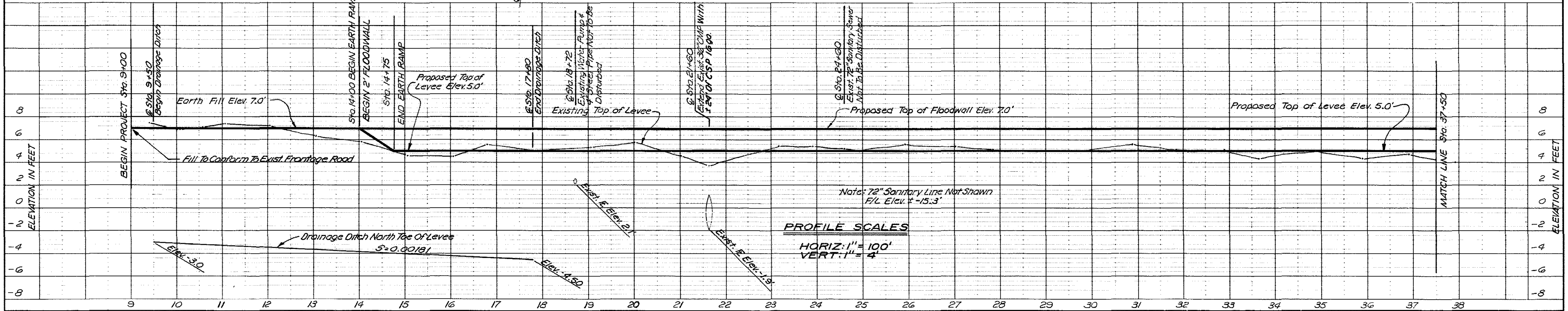
TYPICAL SECTION
STA 9+00 TO 19+00

TYPICAL SECTION
STA. 14+00 TO 19+50±

TYPICAL SECTION
STA 19+50± TO 23+90±

TYPICAL SECTION
STA. 23+90± TO 38+95±

SCALE : 1"= 20'
(Typ.)


BEGIN PROJECT Sta. 9+00
℄ Sta. 9+50 Begin Drainage Ditch
Earth Fill Elev. 7.0'
Fill To Conform To Exist. Frontage Road
Sta. 14+00 BEGIN EARTH RAMP
BEGIN 2' FLOODWALL
Sta. 14+75
END EARTH RAMP
Proposed Top of Levee Elev. 5.0'
℄ Sta. 17+80 End Drainage Ditch
℄ Sta. 18+72 Existing Water Pump # 4" Steel Pipe Not To Be Disturbed
Existing Top of Levee
℄ Sta. 21+60 Extend Exist. 36" CMP With 1-24' Of CSP 16 ga.
℄ Sta. 24+60 Exist. 72" Sanitary Sewer Not To Be Disturbed
Proposed Top of Floodwall Elev. 7.0'
Proposed Top of Levee Elev. 5.0'
MATCH LINE Sta. 37+50
Exist. ℄ Elev. 2.1'
Exist. ℄ Elev. -1.9'
Note: 72" Sanitary Line Not Shown F/L Elev. = -15.3'
Drainage Ditch North Toe Of Levee
S=0.00181
Elev. -3.0
Elev. -4.50
ELEVATION IN FEET
8
6
4
2
0
-2
-4
-6
-8
9
10
11
12
13
14
15
16
17
18
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34
35
36
37
38

PROFILE SCALES
HORIZ: 1"= 100'
VERT: 1"= 4'

REFER TO TRACING FOR LATEST REVISION

REV	DESCRIPTION	SUB	APPR

NOTES
1. T.B.M. – Fd. "□" On Top of N.E. Corner Of Headwall @ Matadero Creek @ Frontage Road Elev. 9.68'
2. T.C.A. – Temporary Construction Area

DATE OF PHOTOGRAPHY

DATE 2-24-76
DESIGN G.G.K.
DRAWN G.M.
CHECKED A.P.M.

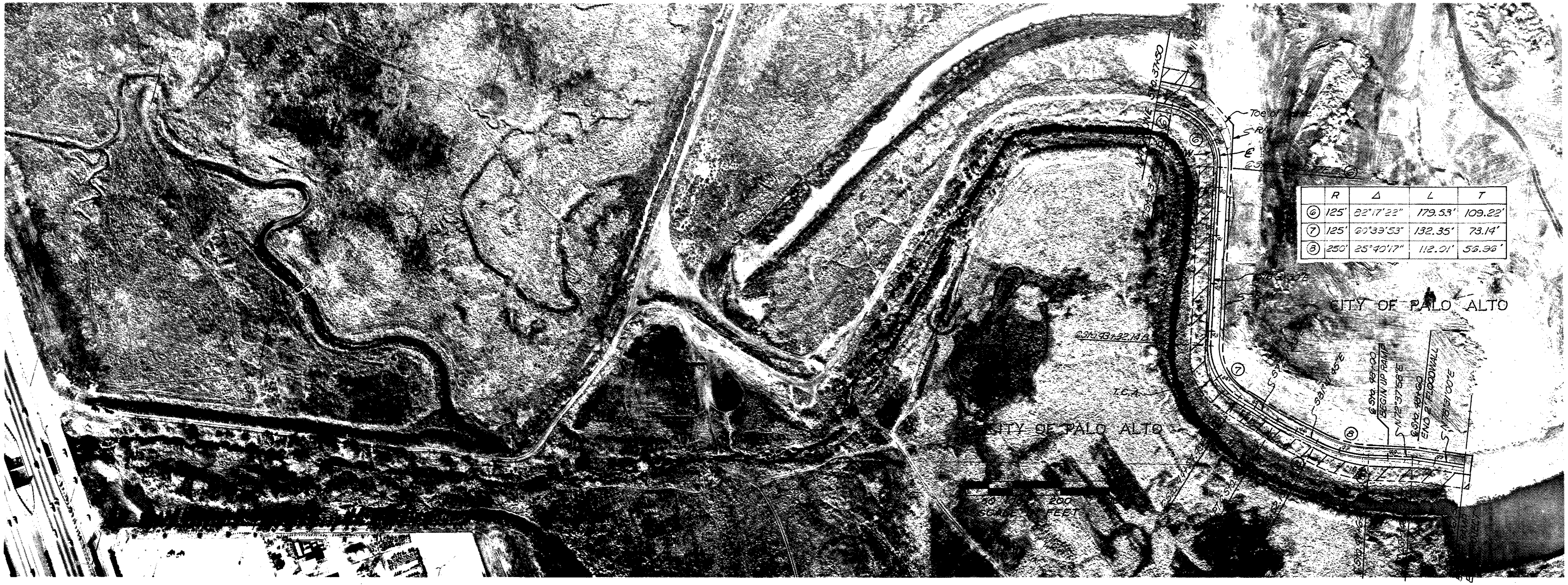
Santa Clara Valley Water District

ENGINEERING CERTIFICATION
Arvind Mody
PROJECT ENGINEER R.C.E. NO. 23118
Bruce Wilson
DIVISION ENGINEER R.C.E. NO. 15851

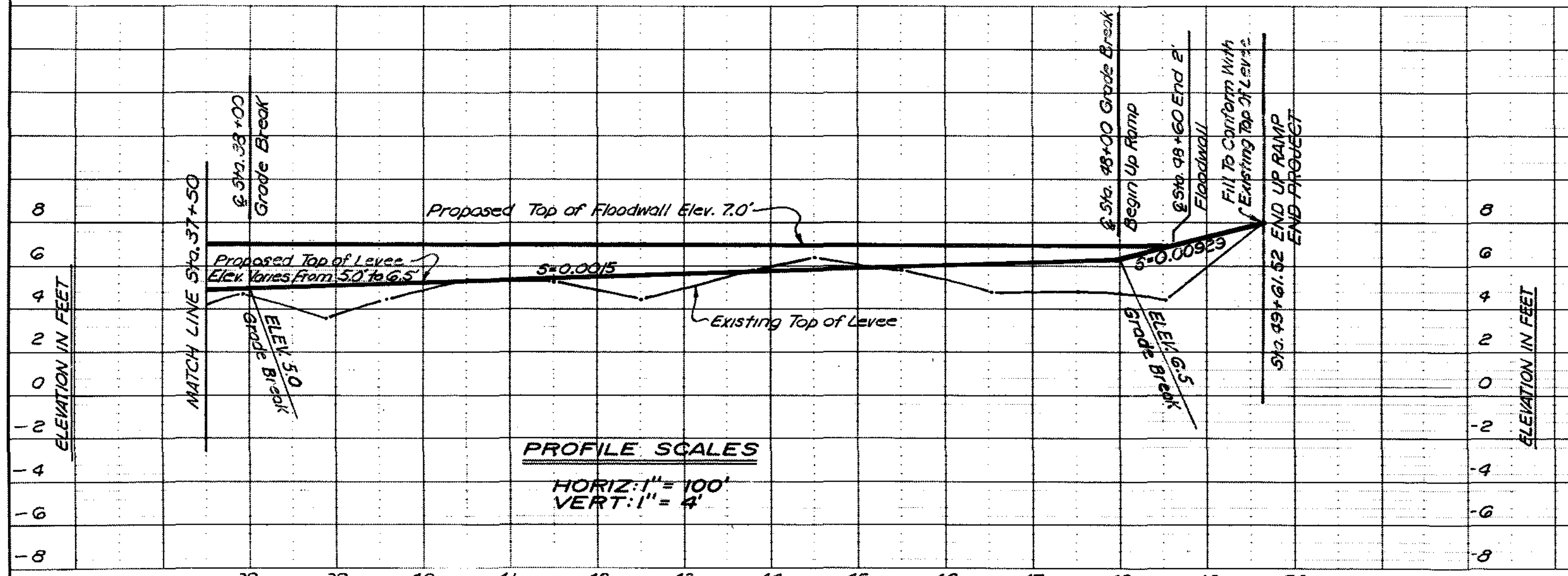
ENGINEERING APPROVAL
Edwin Ferguson
HEAD, DESIGN BRANCH R.C.E. NO. 14455

ZONE NW-1
PALO ALTO FLOOD BASIN

SCALE As Shown
SHEET 2

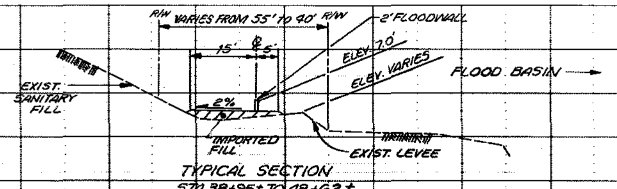


	R	Δ	L	T
⑥	125'	82°17'22"	179.53'	109.22'
⑦	125'	60°33'53"	132.35'	73.14'
⑧	250'	25°40'17"	112.01'	56.36'



PROFILE SCALES

HORIZ: 1" = 100'
VERT: 1" = 4'



TYPICAL SECTION
STA 38+95± TO 48+62±
SCALE: 1" = 20'

REFER TO TRACING FOR LATEST REVISION

REV	DESCRIPTION	SUB	APPR

NOTES
1. T.C.A. - Temporary Construction Area

DATE OF PHOTOGRAPHY

DATE 2-24-76
DESIGN G.G.K.
DRAWN G.M.
CHECKED A.P.M.

Santa Clara Valley Water District

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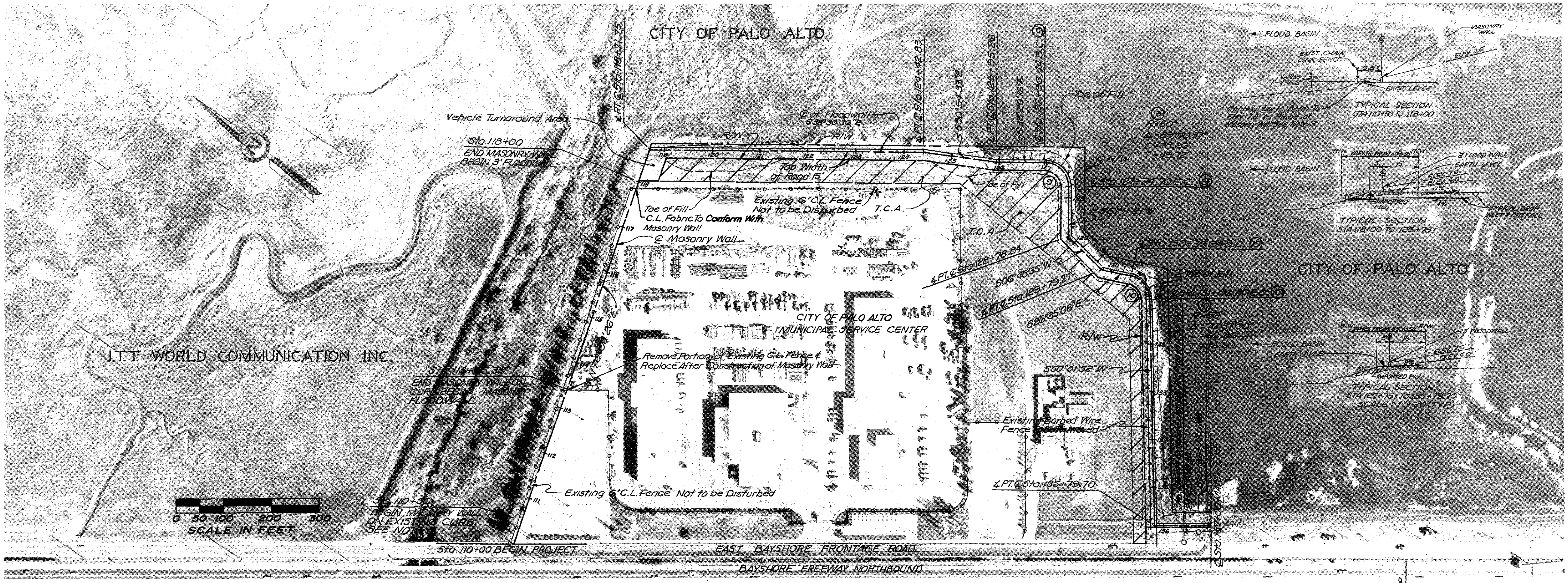
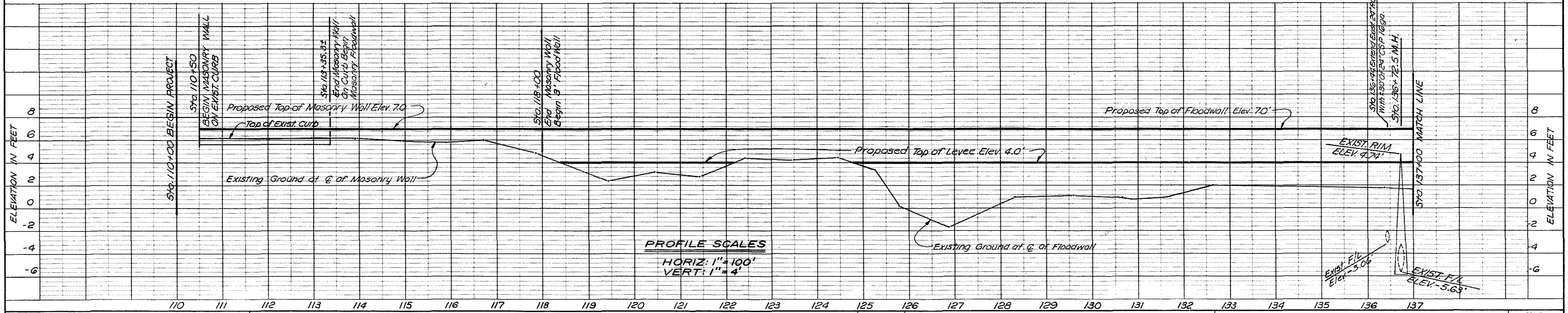
DIVISION ENGINEER R.C.E. NO. 15851

ENGINEERING APPROVAL
Edwin Ferguson
HEAD, DESIGN BRANCH R.C.E. NO. 14455

ZONE NW-1
PALO ALTO FLOOD BASIN

SCALE As Shown
SHEET 3





REFER TO TRACING FOR LATEST REVISION

REV	DESCRIPTION	SUB	APPR

NOTES

1. Before Beginning Any Work Call Pacific Telephone and Telegraph Cable Locating Service At 369-3376
2. T.C.A. - Temporary Construction Area
3. Optional Landscaped Earth Berm to Elev. 7.0' May be Constructed in Place of Masonry Wall Between Sta. 110+00 to Sta. 113+35.3±

DATE OF PHOTOGRAPHY

DATE 2-24-76
DESIGN G.G.K.
DRAWN G.M.
CHECKED A.P.M.

Santa Clara Valley Water District

ENGINEERING CERTIFICATION
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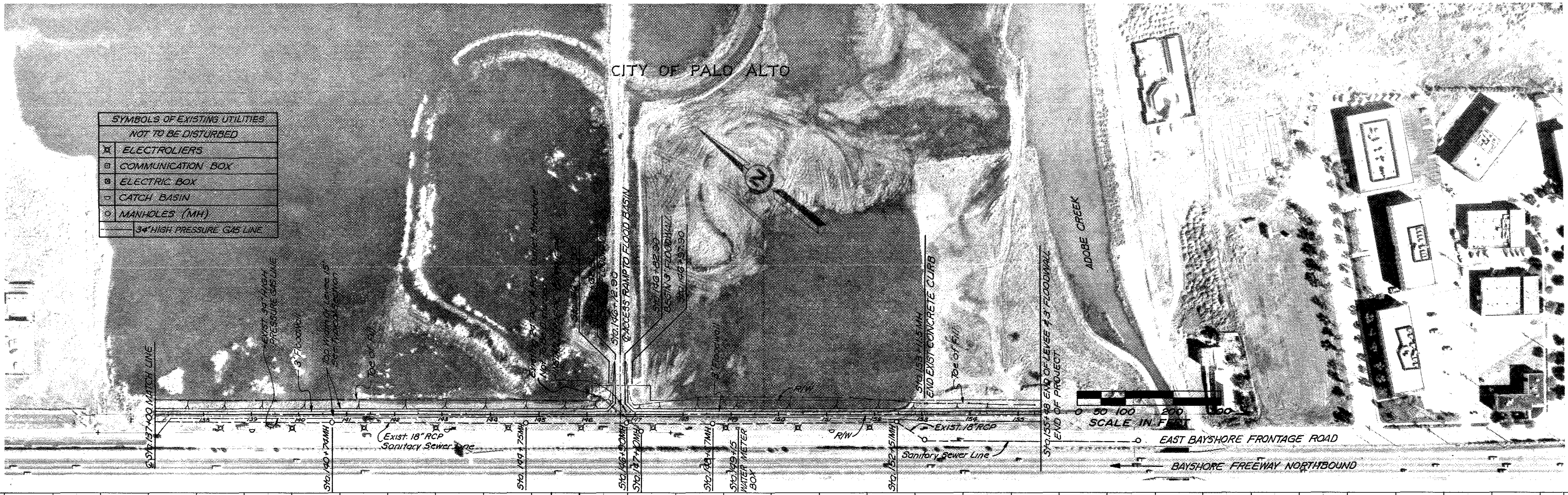
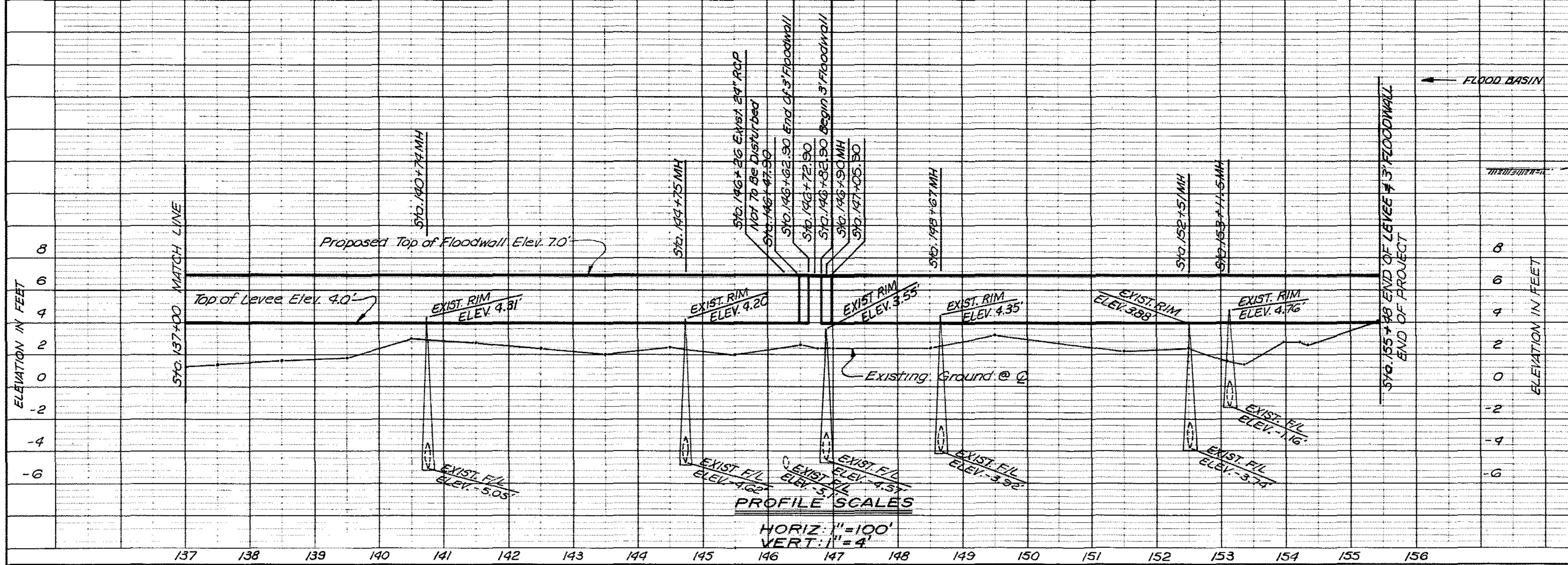
ZONE NW-1

PALO ALTO FLOOD BASIN

SCALE As Shown

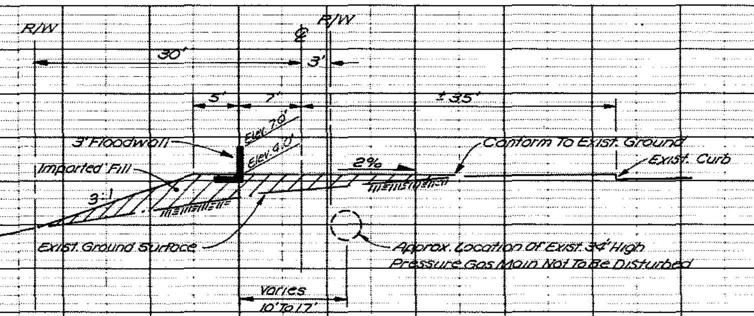
SHEET 4





PROFILE SCALES

HORIZ: 1"=100'
VERT: 1"=4'



TYPICAL SECTION

STA 135+79.70 To 146+62.90
STA 146+82.90 To 155+48
SCALE: 1" = 10'

REFER TO TRACING FOR LATEST REVISION			
REV	DESCRIPTION	SUB	APPR

NOTES

DATE OF PHOTOGRAPHY

DATE
2-24-76
DESIGN
G.G.K.
DRAWN
G.M.
CHECKED
A.P.M.

Santa Clara Valley Water District

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HEAD, DESIGN BRANCH R.C.E. NO. 14455

ZONE NW-1
PALO ALTO FLOOD BASIN

SCALE
As Shown
SHEET
5

FINAL

ENVIRONMENTAL IMPACT REPORT

SANTA CLARA VALLEY WATER DISTRICT

FINAL ENVIRONMENTAL IMPACT REPORT
ON
PROPOSED FLOOD CONTROL MEASURES
ON
THE PALO ALTO FLOOD BASIN

Northwest Flood Control Zone
Project Number 1039

September 1976

Report Prepared
by
Environmental Assessment Division Staff

Under the Direction
of
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Environmental Specialist

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MAURICE E. DULLEA	DISTRICT 4		

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SUMMARY

Project Location, Purpose, and Description

The Palo Alto Flood Basin, located in the City of Palo Alto between Bayshore Freeway and San Francisco Bay (Figures 1A-B), collects floodwater runoffs from Adobe, Barron, and Matadero Creeks.

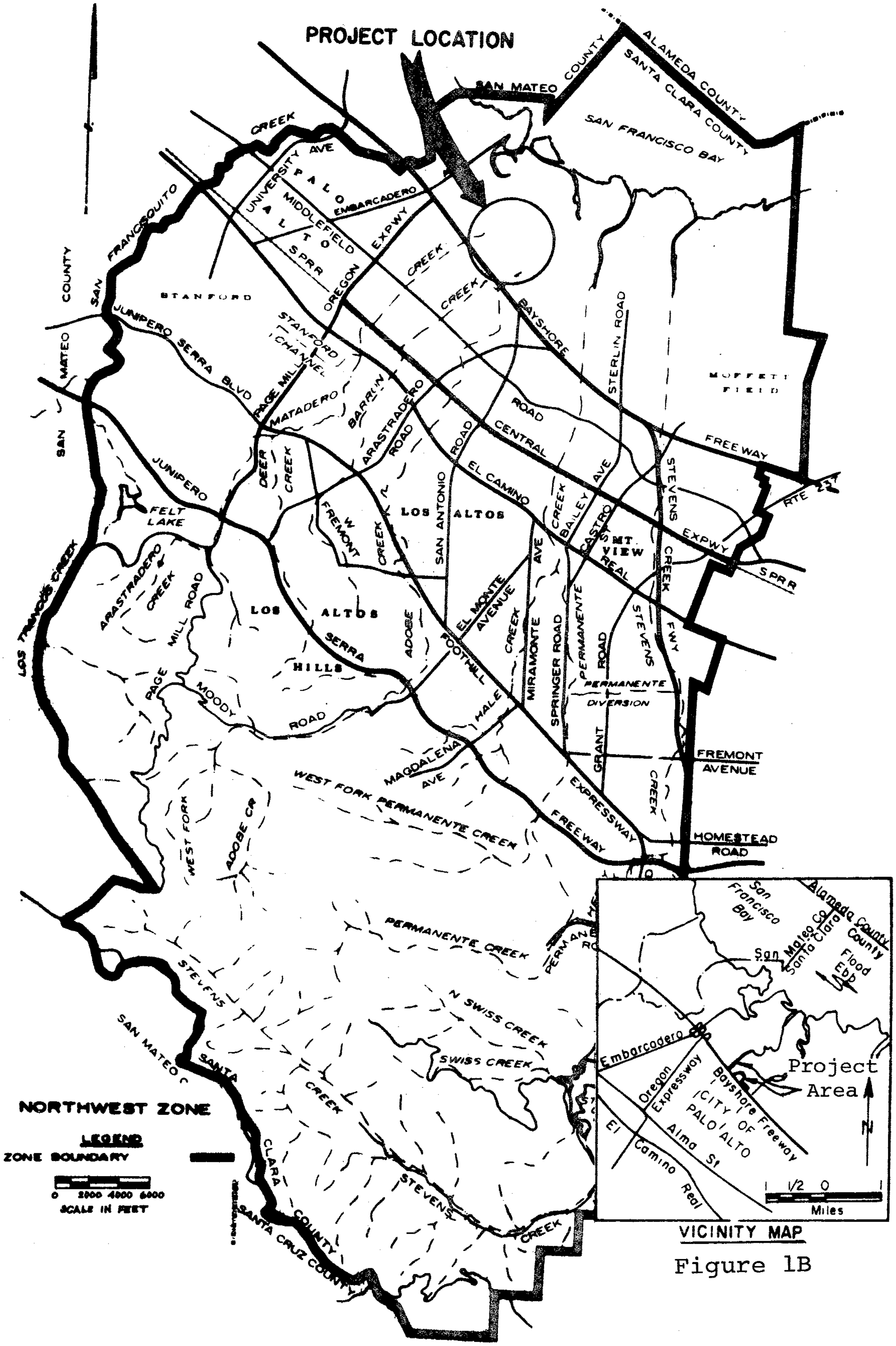
The proposed project will complete a four-phase program (started in 1968) of flood control modifications of the Palo Alto Flood Basin. When the project is completed, 100-year (1%) flood protection will be provided to the urbanized area southwesterly of Bayshore Freeway from waters that can accumulate in the Flood Basin and when all of the design flows from Adobe, Barron and Matadero Creeks can get into the Flood Basin.

The proposed project consists of construction of levees topped by floodwalls to elevation +7.0 feet (mean sea level) along Matadero Creek from the southwest end of the previously constructed levee to East Bayshore Road, around the Palo Alto Municipal Service Center, and along East Bayshore Road (Figure 2).

Adverse Impacts and Mitigation Measures

A. Short-Term (Construction-Related)

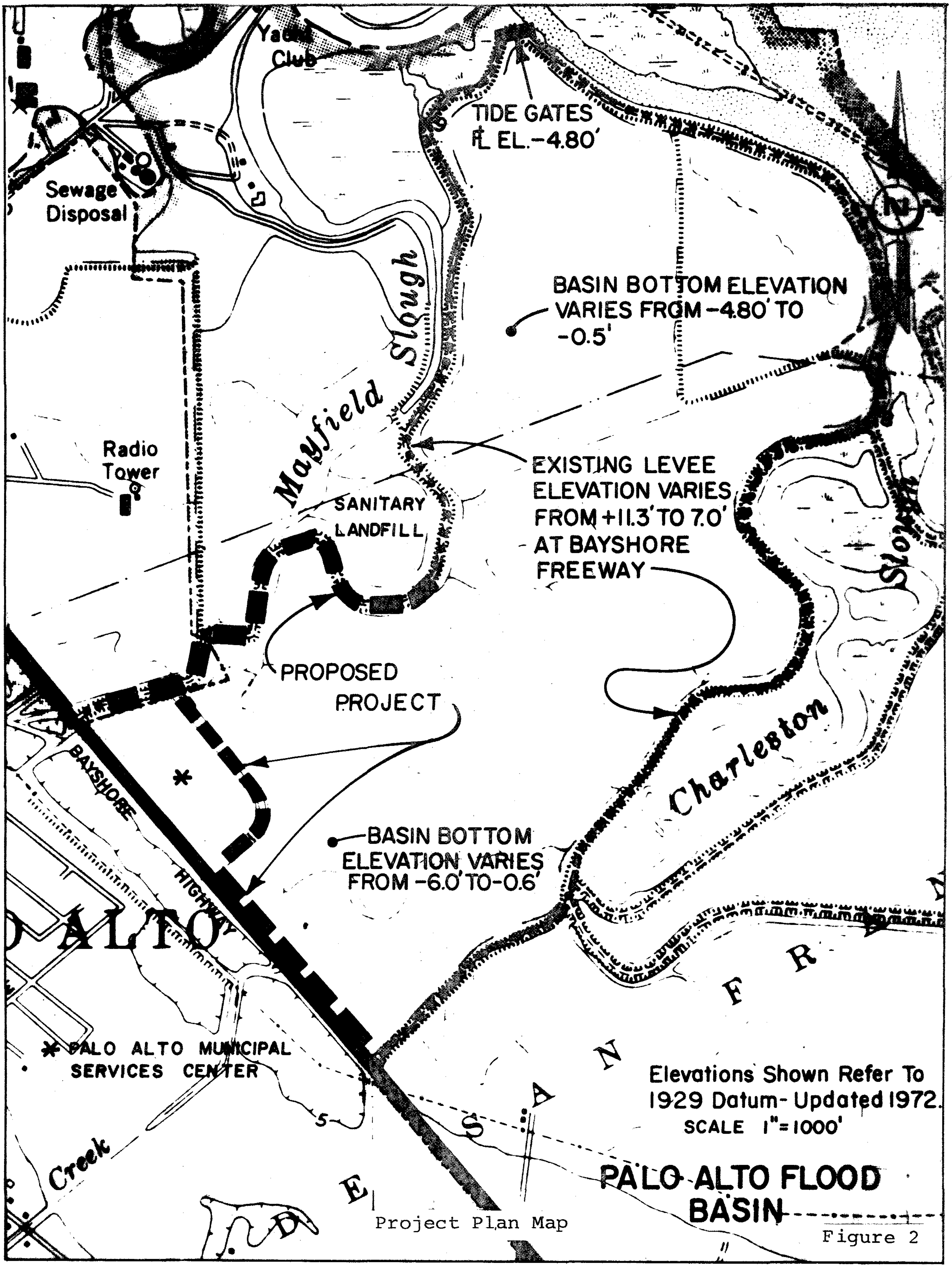
Impacts. Construction activity will temporarily increase noise, dust and particulates, disrupt traffic on East Bayshore Road, increase sedimentation in Matadero Creek until vegetation is reestablished and reduce visual and aesthetic amenities in the construction areas. Energy and materials will be expended. Wildlife will be disturbed or displaced and some recreational uses of the areas will be curtailed during the construction period.



VICINITY MAP

Figure 1B

Figure 1A


Yacht Club
TIDE GATES
FL EL.-4.80'
Sewage Disposal
BASIN BOTTOM ELEVATION VARIES FROM -4.80' TO -0.5'
Mayfield Slough
Radio Tower
SANITARY LANDFILL
EXISTING LEVEE ELEVATION VARIES FROM +11.3' TO 7.0' AT BAYSHORE FREEWAY
PROPOSED PROJECT
BAYSHORE HIGHWAY
BASIN BOTTOM ELEVATION VARIES FROM -6.0' TO -0.6'
Charleston Slough
O ALTO
* PALO ALTO MUNICIPAL SERVICES CENTER
Creek
5
SAN FR
DE
Elevations Shown Refer To 1929 Datum- Updated 1972.
SCALE 1"=1000'
PALO ALTO FLOOD BASIN
N

Project Plan Map

Figure 2

Mitigation. The Contract Specifications for construction of the project will specify abatement of noise, dust, gaseous emissions, chemical materials, water and air pollution, spillage and preservation of all vegetation which is not desired to be removed. Disturbance to birdlife will be reduced by minimizing construction during the nesting season. Erosion and visual disruption will be mitigated by landscaping as soon as possible after construction is completed.

B. Long - Term

Impact. Motorists on Bayshore Freeway and East Bayshore Road will permanently lose the view of much of the Flood Basin interior due to construction of the floodwall along East Bayshore Road.

Mitigation. The loss of the view cannot be mitigated. The floodwall will be aesthetically designed to improve its appearance; the design will be reviewed and approved by the City of Palo Alto's Architectural Review Committee prior to construction.

Impact. Approximately 1.2 acres of largely weedy vegetation will be covered by construction of the levees.

Mitigation. The levees will be landscaped with native and naturalized plants to benefit local wildlife and improve the aesthetic value of the area.

Impact. Vehicular access now afforded to the interior of the Flood Basin from East Bayshore Road will be restricted.

Mitigation. While some may object to the restriction, the City of Palo Alto has designated the Flood Basin as a wetlands preserve and wants to discourage vehicular traffic in the interior of the Basin.

Alternatives to the Proposed Project

A. No Project

The adverse impacts of the proposed project would be avoided, but the flood hazard to an urbanized area of Palo Alto would remain, even if Adobe, Barron and Matadero Creeks were improved first.

B. Alternative Structures Using Native Fill

Earth fill excavated from the Basin floor to construct the levees either alone or in combination with a floodwall would result in considerable loss of vegetation. This approach was rejected as being environmentally unacceptable.

C. Alternative Structures Using Imported Fill

Various alignments and combinations of levees and floodwalls using imported fill have been studied to provide the required flood barrier. The proposed project design is the consensus selection of the Citizen's Flood Basin Study Committee who met periodically with District staff to assist in the planning process.

An alternative to the floodwall along East Bayshore Road is to raise the road to an elevation of +7.0 feet, which would provide the same level of flood protection as the floodwall. The elevated road would avoid the loss of view of the Basin but would require major relocations of buried utilities, interfere with traffic during construction and have greater construction impacts than the floodwall. In addition, the raised road would not provide an additional lane off the main road for parking, a feature desired by the City of Palo Alto. On balance, the benefit of this design alternative was not judged significant enough to offset the adverse impacts to warrant its selection.

I. DESCRIPTION OF THE PROPOSED PROJECT

The history, location, objectives and engineering description of the proposed project are described in detail in the accompanying Engineer's Report for the proposed project and, therefore, will not be discussed further in this section of the EIR.

II. ENVIRONMENTAL SETTING PRIOR TO PROJECT

A. PHYSICAL SETTING

1. Regional Topographic and Geologic Features

The Palo Alto Flood Basin is located in the northwestern portion of north Santa Clara Valley, a structural depression south of San Francisco Bay in the Central Coast Ranges of California. Figure 3 shows the regional geology. The valley floor is filled with unconsolidated, young alluvial and inland sea deposits washed down from the Santa Cruz Mountains on the west and the Diablo Range on the east. The alluvial deposits exist as gently sloping alluvial fans from individual streams. These fans have merged laterally to form a continuous alluvial apron along the upper elevations of the valley floor adjacent to the mountains. The alluvial fan deposits consist of gravel, clay and gravel, sand, silt and lesser amounts of clay. These alluvial fans slope down toward San Francisco Bay; at their base, they merge into the flat Baylands, which fringe San Francisco Bay.

The Baylands are underlain by finer grained stream basin deposits, tidal deposits and shallow marine deposits of San Francisco Bay. These deposits consist predominantly of clay and silt, with lesser amounts of sand and gravel. The subsurface contact between the alluvial deposits and the Bayland deposits is one of a complex interfingering nature, reflecting varying modes of deposition as the levels of San Francisco Bay fluctuated in ancient times. The topography of the project site varies from a few feet below mean sea level to about 4-7 feet above mean sea level.

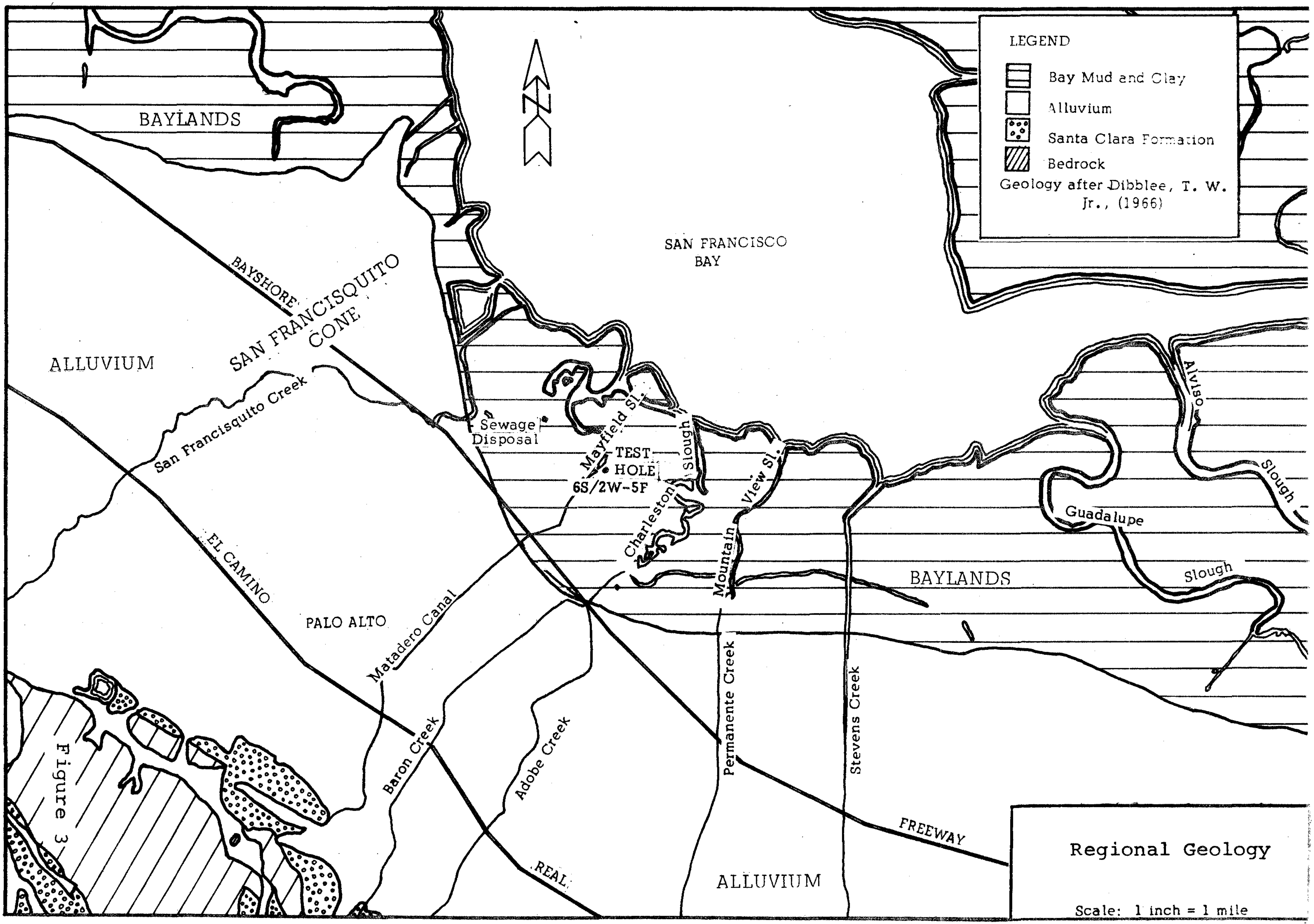


Figure 3

Regional Geology

Scale: 1 inch = 1 mile

2. Geology and Soils

a. Geology

The project site is located in the Baylands at the mouths of Matadero Creek, Barron Creek, and Adobe Creek. The site is essentially a flat, tidal marsh, just above and just below the level of San Francisco Bay. The flat surface has been incised by meandering stream channels to depths of 2 to 4 feet, forming the present sloughs, and by other smaller, shallower drainage channels, creating meandering patterns.

The Flood Basin was created in recent years by enclosing the site with a levee system allowing the flows of the three tributary creeks to collect within the confined area during storm flows. These flows are later discharged into San Francisco Bay during low tides through tide gates on Mayfield Slough. Barron Creek, formerly a tributary to Adobe Creek at the Baylands, was in the past modified to discharge into Adobe Creek upstream of Bayshore Freeway.

Local water well logs indicate that the project site is underlain by clay and silty clay with interbeds of sands and gravels. Shallower foundation exploration borings (less than 50 feet deep) indicate the site to be underlain by soft, compressible "bay muds" varying in depths from one to ten feet. The bay muds consist of gray-black, fat clay*and silty clay deposited in a marshland environment with particularly high organic content in the uppermost zone. These bay muds are underlain by more compacted and firm gray-black clays and silty clays. The bay mud clays are interspersed by thin beds and lenses of sand, silty sand and minor amounts of gravel.

---

*Fat clay is a highly plastic clay with a liquid limit of 50% or greater.

b. Seismicity

There is no surface evidence of active faults in the local area of the project. Older faults, which may be concealed beneath the most recently deposited sediments, may occur here and in nearby areas. If they do occur, these older faults would offset only the older bedrock and the lower portion of the valley fill deposits; hence, these faults are considered inactive.

Major faults in the region include the San Andreas Fault, located 8 miles to the southwest in the Santa Cruz Mountains; the Hayward Fault, located 13 miles to the northeast along the northeastern edge of Santa Clara Valley; and the Calaveras Fault, located 17 miles to the northeast in the Diablo Range. Because of the proximity of these three major active faults, the regional area of the project site is considered a relatively high seismically active area. Within the lifetime of the project, a large earthquake and several moderate earthquakes affecting the site can be expected in the region.*

All areas within the Santa Clara Valley are subject to ground shaking from moderate and large earthquakes. Generally, the worst effects of ground shaking and possible ground failure within the valley floor occur in those areas underlain by saturated, weak, clayey soils, such as those found in the Baylands. Under strong or moderate seismic shaking, the levee and the weak levee foundation may tend to lose stability, causing settlement and lateral spreading, which may lead to levee failure, particularly if liquefaction occurs. This would cause flooding in areas adjacent to the breached levees during flood flow conditions.

---

*Large ("major" and "great") earthquakes are larger than 6.8 on the Richter Scale. Moderate earthquakes range from 5.2 to 6.8 on this scale (after Gutenberge and Richter, 1949).

The shallow exploration well-boring logs referred to above do not indicate the presence of the fine-grained, clean sand zones within the shallow zone which cause liquefaction; consequently, the probability of liquefaction is low to moderate, but it is still a hazard due to the presence of weak saturated clays. Liquefaction would aggravate already existing weak foundation conditions.

c. Soils

Soils in the flood basin are classified as clayey tidal marsh soil. These soils are affected by surface saltwater and highly salty groundwater occurring at shallow depths; consequently, they cannot be easily used for agricultural purposes. However, salt marsh vegetation requiring saline conditions thrives in such soils.

3. Hydrology and Water Quality

a. Hydrology

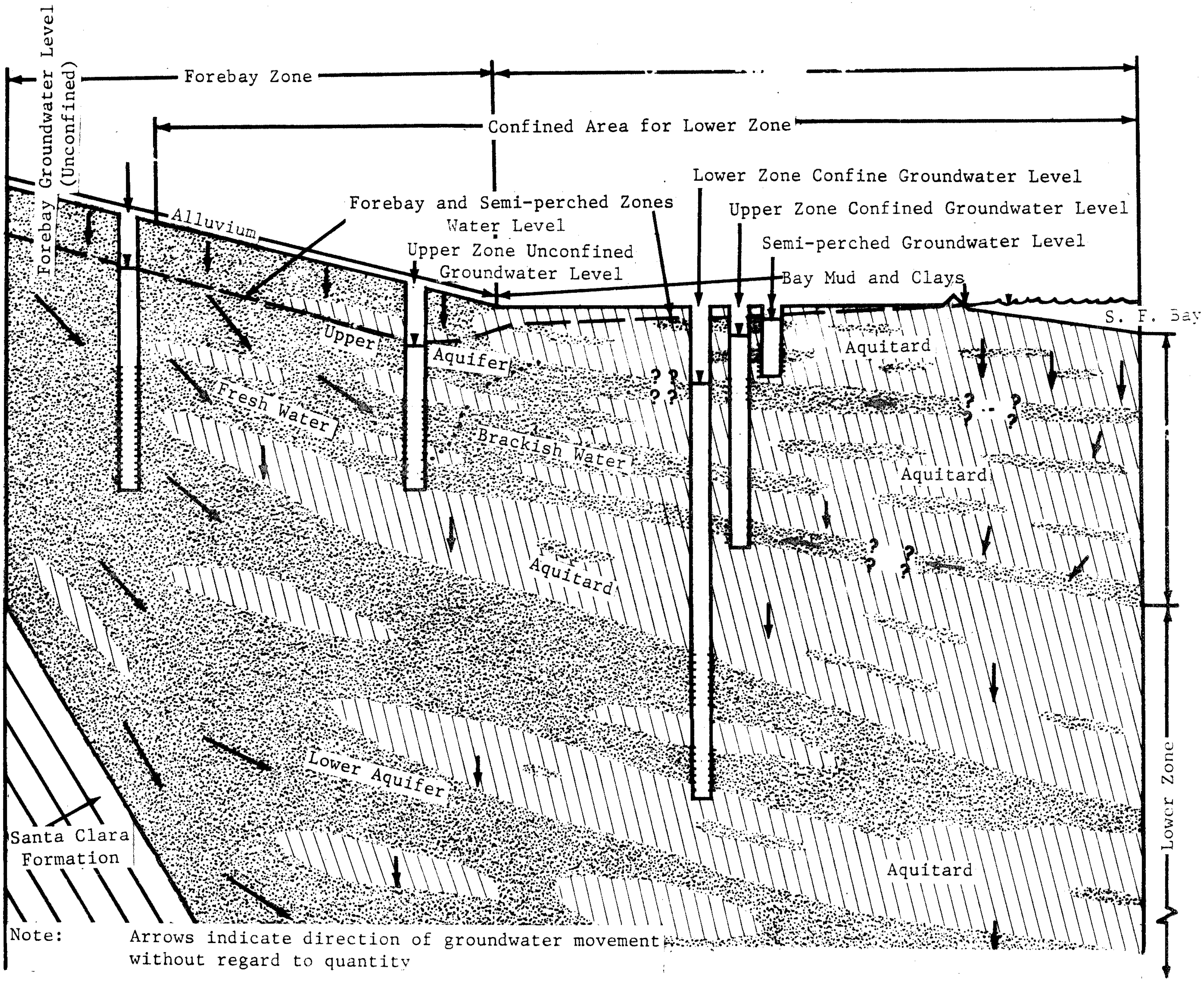
The basic elements of surface water hydrology for the Flood Basin, for Adobe, Barron and Matadero Creeks and the extent of the flooding problem in Palo Alto are presented in the Engineer's Report and need not be repeated here.

The unconsolidated alluvial sediments which underlie the valley floor area of Santa Clara Valley constitute a large and significant groundwater basin. The project site lies within the interior Baylands area of the Valley where the underlying materials consist of a very thick clayey section, complexly interpersed with thin channels, beds and lenses of sand and gravel. The principal aquifers are these sand and gravel layers.

The groundwater in the project area is generally divided into two broad units, the upper zone and the lower zone. These zones are separated by an extensive clay layer, or "aquitard", which effectively delineates the two zones at depths of about 150 feet. All waters occurring in the lower zone are confined (under pressure) by this clay layer which thins out to the west of the project site, where the groundwater becomes a single, unconfined zone (water table condition). Figure 4 shows a representative cross section of local groundwater conditions.

The uppermost groundwater in the upper zone of the Baylands is considered semi-perched. This condition implies that this groundwater is perched on clay layers within the predominantly clayey section, but with an unsaturated zone occurring between the perched groundwater and main groundwater below it. Water levels in the upper zones, whether confined or semi-perched, are generally shallow, at depths of less than 5 feet. The upper zone is recharged from streamflow seepage and percolation of rainfall through the imperfections of clayey confining layers or from unconfined areas west of the project site. Groundwater moves generally toward local wells.

Groundwater in the lower zone occurs confined and is recharged from the unconfined zone (forebay) to the west beyond the thin edge of the extensive confining layers. The only connection between the upper and lower zones within the project area would be through improperly constructed or defective wells. Movement of groundwater in the lower zone would be from its


Forebay Groundwater Level (Unconfined)
Forebay Zone
Confined Area for Lower Zone
Lower Zone Confine Groundwater Level
Upper Zone Confined Groundwater Level
Semi-perched Groundwater Level
Forebay and Semi-perched Zones Water Level
Upper Zone Unconfined Groundwater Level
Alluvium
Bay Mud and Clays
S. F. Bay
Upper Aquifer
Aquitard
Fresh Water
Brackish Water
Aquitard
Aquitard
Lower Aquifer
Aquitard
Santa Clara Formation
Lower Zone

Note: Arrows indicate direction of groundwater movement without regard to quantity

Figure 4

Groundwater in the Palo Alto-Mountain View Area forebay along the western edge of the valley to areas of pumping in the valley interior.

With the development of groundwater for agricultural and municipal uses starting about the turn of the century, water levels in the upper zone began declining. This induced seawater intrusion in the upper zone created by an inland gradient condition from San Francisco Bay. With the lowering of the piezometric pressure* within the confined lower zone, land subsidence started. Within the project area, the land surface subsided three to four feet between 1934 and 1967**. Subsidence stopped in 1969 due to the partial recovery of the piezometric pressure caused by the reduction of pumping in the area, and several above-normal rainfalls of the years since 1969. Reduction of pumping resulted from the substitution of imported water from the City of San Francisco's Hetch Hetchy Project and the State's South Bay Aqueduct for the local groundwater. As long as the present piezometric levels are maintained or improved, subsidence is not expected to resume. Conversely, if piezometric levels begin to decline below their earlier (pre-1969) levels, land subsidence will resume, resulting in further sinking of the Flood Basin levees; if the amount exceeded that allowed in the design, levees would have to be raised again. Future overdrafting would also further induce seawater intrusion, lowering water quality in some wells and rendering others unusable.

---

* Piezometric pressure is the confined aquifer pressure caused by overlying clayey layers.

** Tudor Engineering Company, 1973.

b. Water Quality

In terms of dissolved minerals, runoff from Matadero, Barron and Adobe Creeks is a magnesium-calcium bicarbonate type of good quality. During individual storms, the early runoff from the upstream urban area primarily washes contaminants from paved surfaces and becomes degraded. Subsequent runoff largely reduces this water quality degradation by dilution of contaminants.

When the runoff stagnates within the sloughs of the Flood Basin, it becomes degraded by mixing with Bay waters leaking through the tide gates, by the addition of salt from leaching the inherently salty soils, by concentration from evaporation, and by a rise in temperature (which reduces dissolved oxygen levels). Surface waters in the sloughs vary widely in total dissolved solids content, ranging from 1,000 to 50,000 milligrams per liter (mg/l), and in chloride content, ranging from 400 to 20,000 mg/l. BOD and large changes in COD are also experienced in the sloughs. A July 1974 sampling gave a total dissolved solids content of 1120 mg/l in Matadero Creek adjacent to the proposed raised levee.*

Upper zone groundwaters in the project area are degraded by saltwater to varying degrees with upper levels of total dissolved solids of nearly 50,000 mg/l and chlorides of 25,000 mg/l. According to the few available logs in the project area, the depth of the affected zone is almost 100 feet.**

Groundwaters in the lower zone are not affected by seawater intrusion in the project area; consequently, their quality is suitable for most domestic and industrial uses. The water quality in the lower zone could be adversely affected by operating improperly constructed or defective wells which would allow degraded waters in the upper zone to contaminate the lower zone. This problem can largely be eliminated by proper well construction techniques. The District has adopted a Well Construction and Abandonment Standards Ordinance to implement these standards.

---

* Engineering-Science, Inc., 1975, Table 4, p. 47.

** Source: District Files.

4. Climate and Air Quality*

a. Climate

The Santa Clara Valley is considered semiarid; average annual rainfall in Palo Alto is about 14 inches. About ninety percent of the rain occurs from November through April with an average of 58 rainy days.

Temperature and rainfall vary throughout the Valley and surrounding mountains due to differences in topography and exposure. Prevailing northerly winds in the summer and southerly winds during storm periods in the winter vary in direction and magnitude according to the topography. Wind speeds are generally light; the average velocity ranges from 6.3 miles per hour (NNW direction) in November to 10.7 miles per hour (NNW direction) in June. Maximum wind speeds are generally between noon and 5:00 p.m.

Temperatures range from an average daily minimum of 38°F in January to an average daily maximum of 81° in July. Summer temperatures are mild, with an average of only 16 days per year when temperatures exceed 90°F.

---

* Source for Section: Engineering-Science, Inc., 1975, pp. 50-55.

b. Air Quality

Air quality in the project area is generally slightly degraded, with State oxidant standards exceeded, on the average, about once a month, as shown in Table 1.

At the project site itself, however, air quality is probably significantly worse than shown in Table 1 due to the nearly 100,000 cars per day traveling on Bayshore Freeway. Consequently, significantly higher concentrations of carbon monoxide, lead, nitrogen oxides and reactive hydrocarbons can be expected along the levees paralleling the freeway than would be recorded in downtown Redwood City or Mountain View, the nearest monitoring stations.

5. Noise*

The existing noise levels in the Palo Alto Flood Basin are primarily caused by the vehicular traffic on the nearby Bayshore Freeway. The L_{50} noise level (noise level that is equalled or exceeded 50 percent of the time) was calculated for various distances extending for most of the approximately one-half-mile into the Flood Basin. These L_{50} noise levels, presented in Table 2, are for the peak traffic of 9600 vehicles per hour** at the Embarcadero Road/Oregon Expressway overcrossing.

---

* See Appendix B for full text of acoustical survey by R. L. Turner, Jr., Consulting Engineer.

** Source: CALTRANS, 1975.

TABLE 1. AIR POLLUTION IN SOUTH BAY COMMUNITIES IN 1974

Pollutant	State Standard	Federal Primary Standard	Community			
			Sunnyvale	Mountain View	Redwood City	San Jose
Oxidants	At least 10 pphm* for 1 hr	Greater than 8 pphm for 1 hr				
Maximum Level, pphm			18	15	18	28
Days State Standard Exceeded			31	15	11	69
Days Federal Standard Exceeded			46	18	20	87
Carbon Monixide	10 ppm** for 12 hrs.					
Maximum Level, ppm (8-hour average)			9.1	–[a]	8.8	16.9
Days State Standard Exceeded			2	–	0	14
Suspended Particulates	100 ug/m^3*** for 24 hrs.					
Annual Mean Level, ug/m^3			41	–	50	59
Percent of Days Observed on which State Standard Exceeded			25	–	5.8	12.0

[a] Dash indicates no data available.

*pphm = parts per hundred million.

**ppm = parts per million.

***ug/m^3 = micrograms per cubic meter.

Source: Bay Area Air Pollution Control District

TABLE 2

L_{50} Noise Levels for the Palo Alto Flood Basin for Peak Hour Traffic Hours on Adjacent Bayshore Freeway

Distance from Freeway feet	L_{50} Noise Level, dBA
240	69.2
340	67.0
540	64.0
940	60.5
1740	56.5
3340	52.3

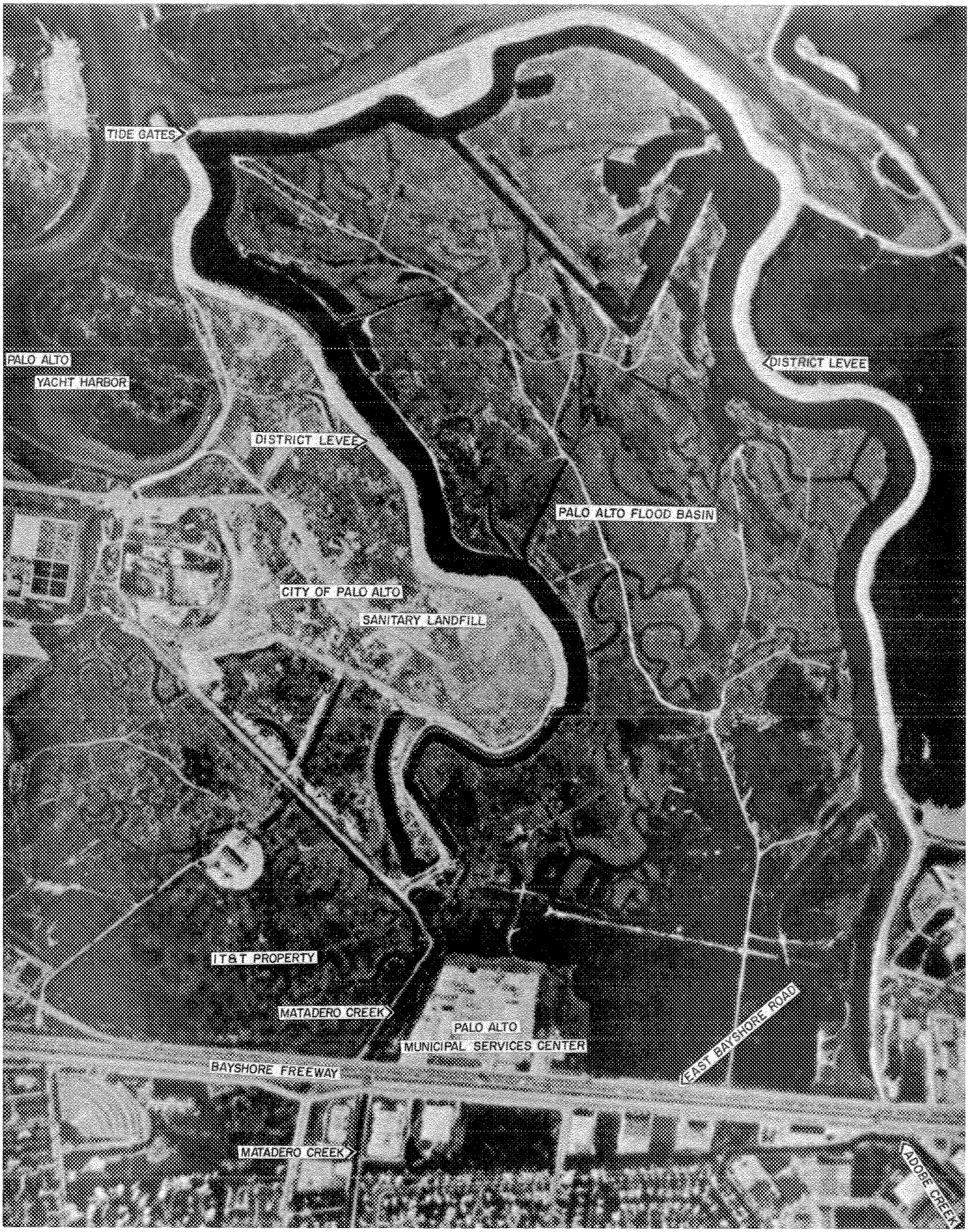
The calculated noise levels in Table 2 include local area noise sources. Table 2 was derived from noise survey data taken in the Flood Basin on Wednesday, January 15, 1975.

Aircraft flying in the area had a significant effect on the noise levels in the Flood Basin. An increase of up to about a 5 dBA in noise level for a short period of time was recorded from this source.

6. Visual and Aesthetic Resources

The majority of the Flood Basin is covered with upland meadow and marshland vegetation and is characteristically flat and limited in vertical relief. The views across the area are of a subhorizon perspective for the most part; i.e., the horizon itself (eye-level) is the highest point in the view. Movement and interest in the landscape, both on the ground and in the air, is created by the constantly feeding and foraging bird life. The site photographs, Figures 5A-G, show many of the visual as well as ecological features of the project site.

Scenic qualities of the Flood Basin described in the Palo

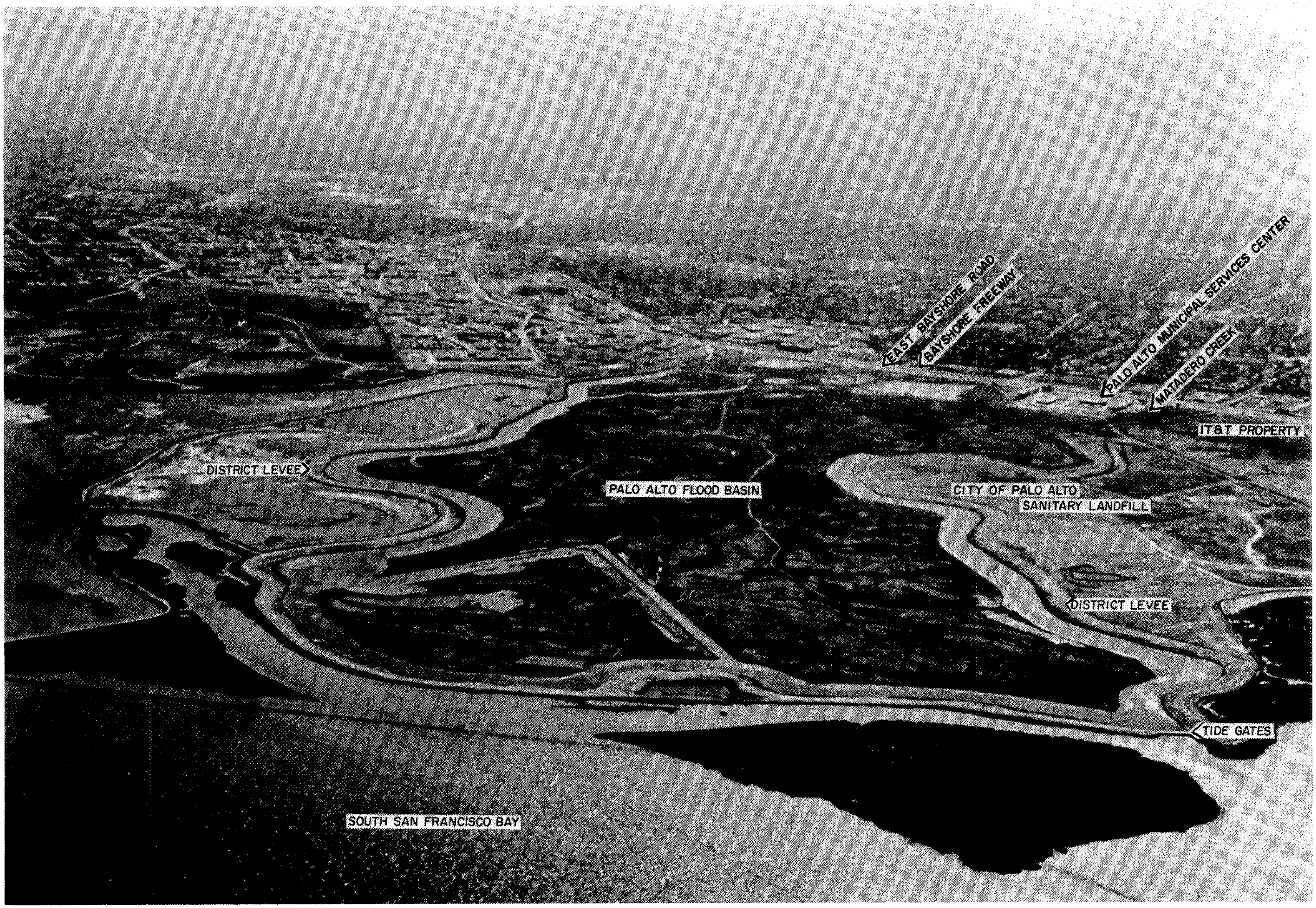


Vertical Photograph of Palo Alto Flood Basin

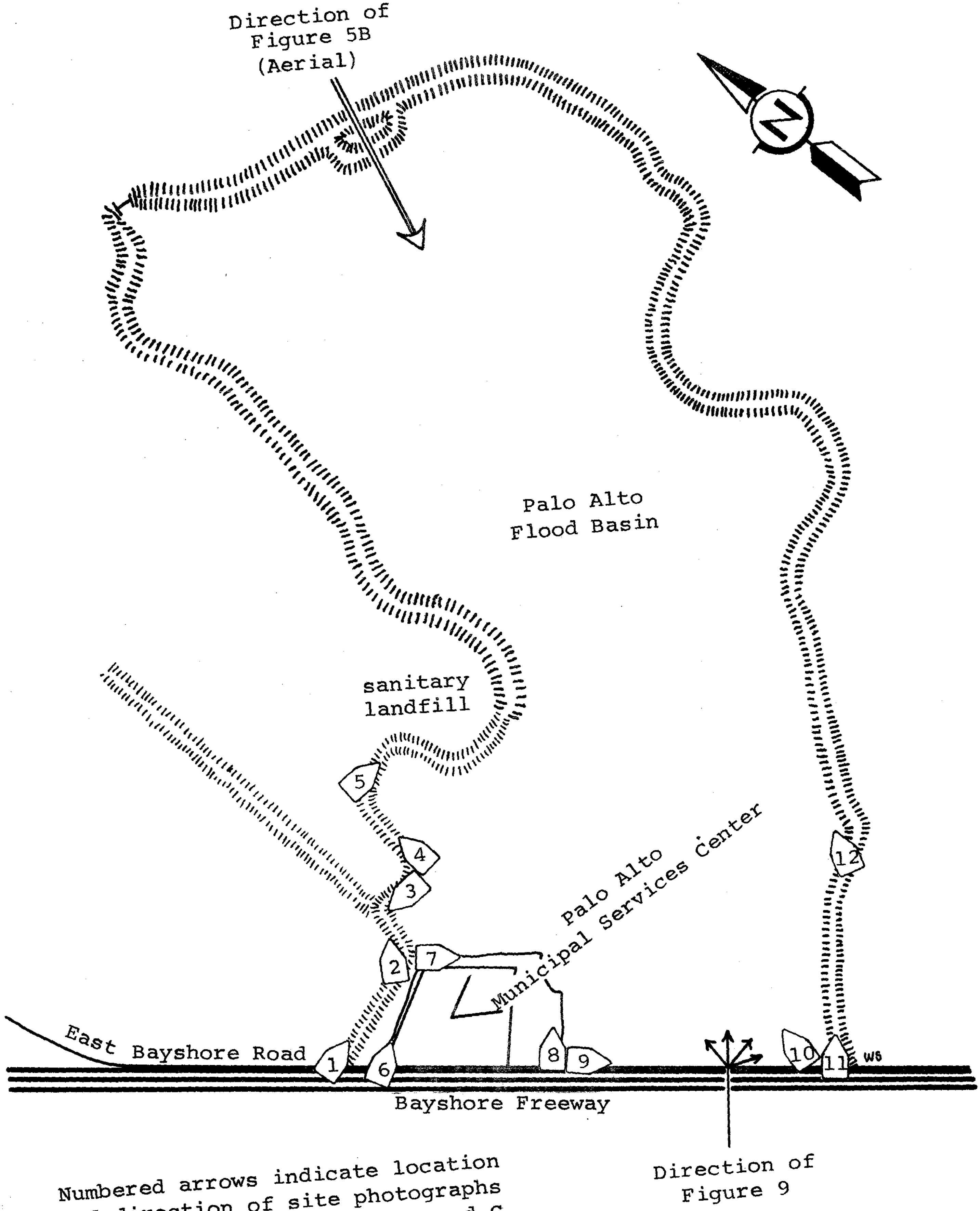
Figure 5A

(Original color photograph courtesy of NASA)

Figure 5B



Aerial Photograph of the Project Area
(Taken looking south-southwest
toward Palo Alto)

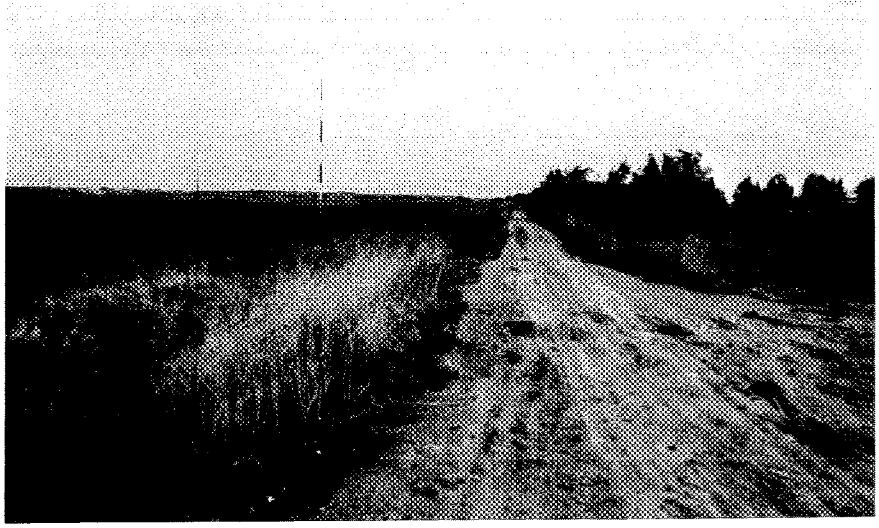


Numbered arrows indicate location and direction of site photographs depicted in Figures 5D,E,F, and G.

Figure 5C

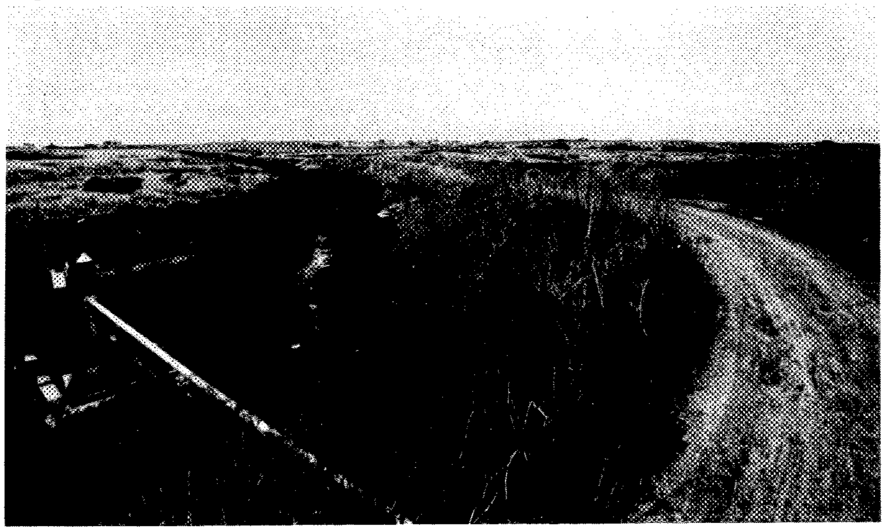
Locations of Site Photographs

1



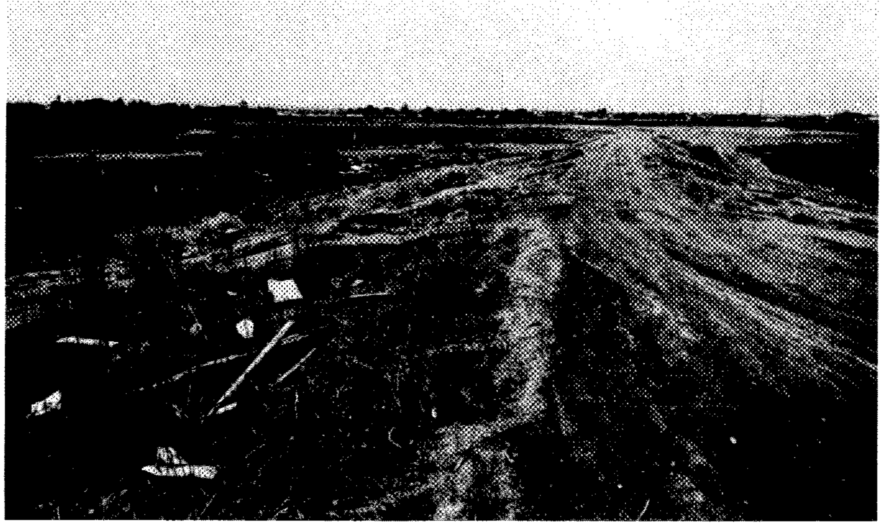
Trees to the right of the road are part of the Matadero Creek riparian vegetation.

2



Small structure (left) is a pump which discharges surface runoff from IT&T property into the Flood Basin.

3

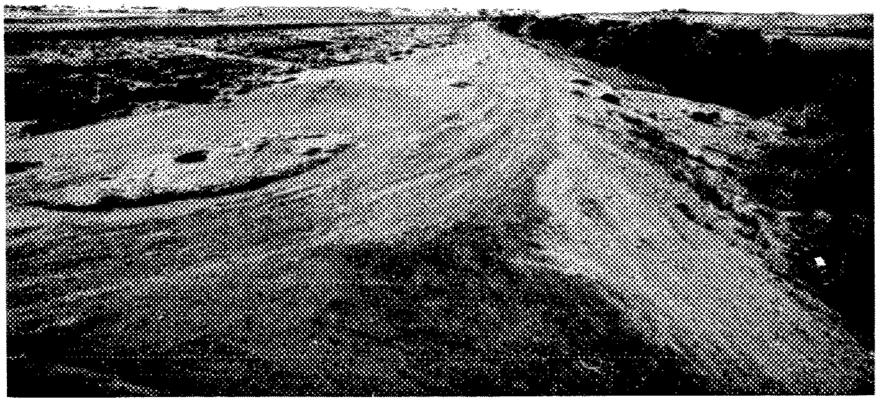


Uncontrolled access allows illegal trash dumping in parts of the Flood Basin.

For location and direction of these photographs, refer to Figure 5C.

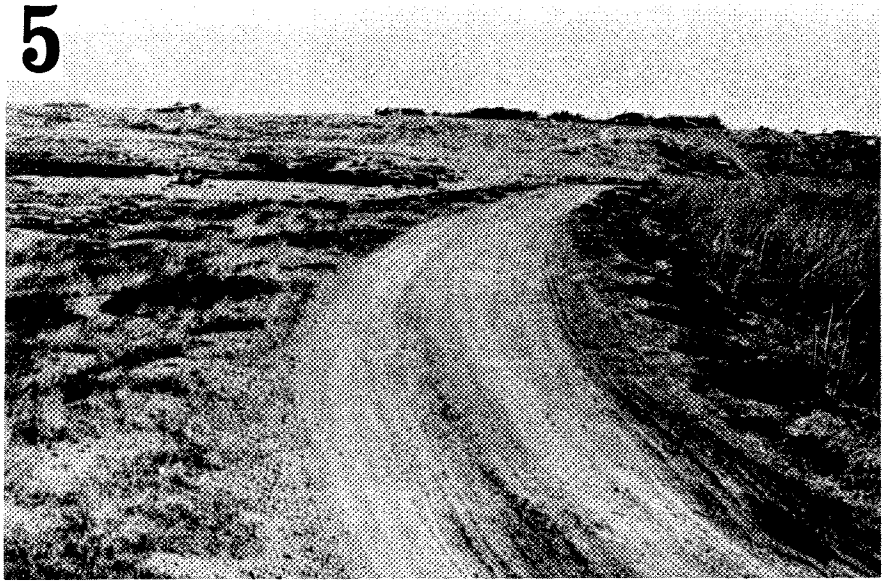
Figure 5D

4



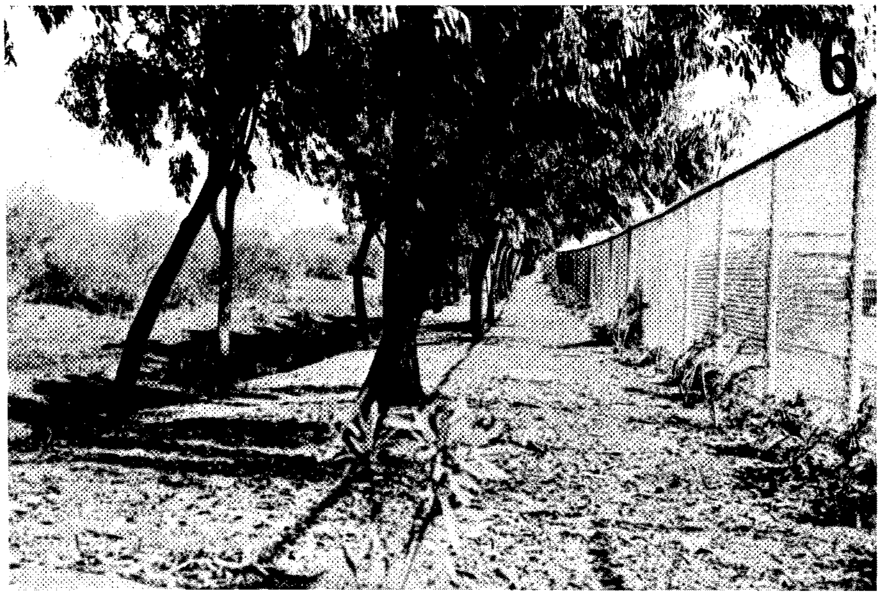
City of Palo Alto's sanitary landfill operation is visible in the background.

5



Completed sanitary landfill forms the higher background in this photograph.

6

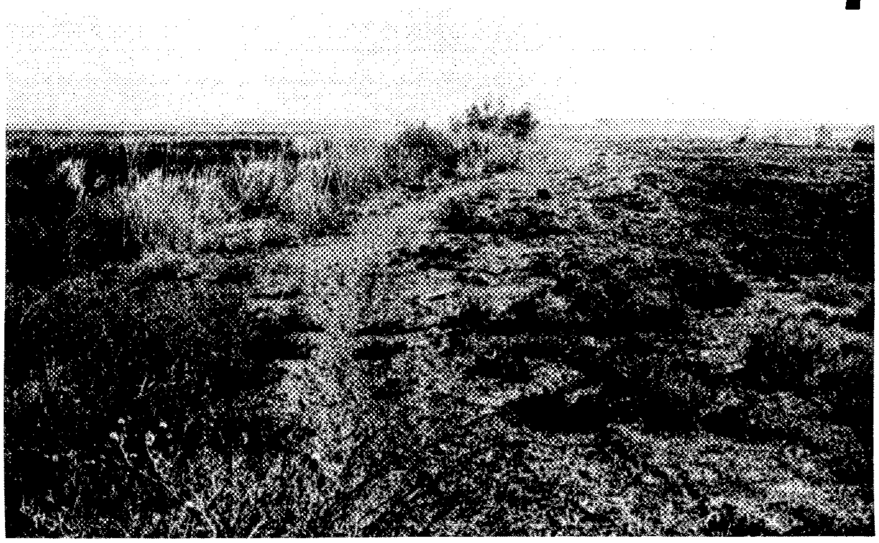


Chain-link fence surrounding the Municipal Services Center. The trees are landscaped eucalyptus.

For location and direction of these photographs, refer to Figure 5C.

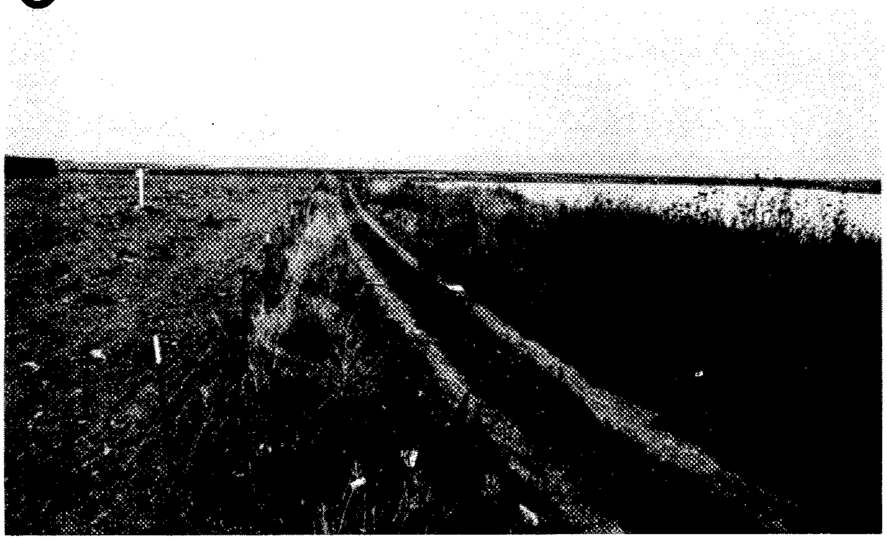
Figure 5E

7



8

This dirt road parallels the eastern border of the Municipal Services Center.



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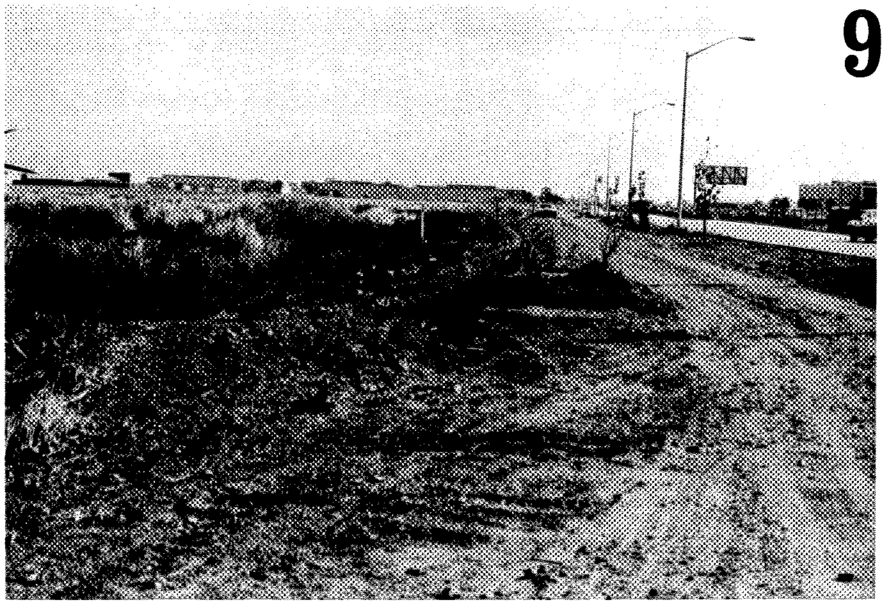


Street(right) is East Bayshore Road, bordering the southern edge of the Flood Basin.

For location and direction of these photographs, refer to Figure 5C.

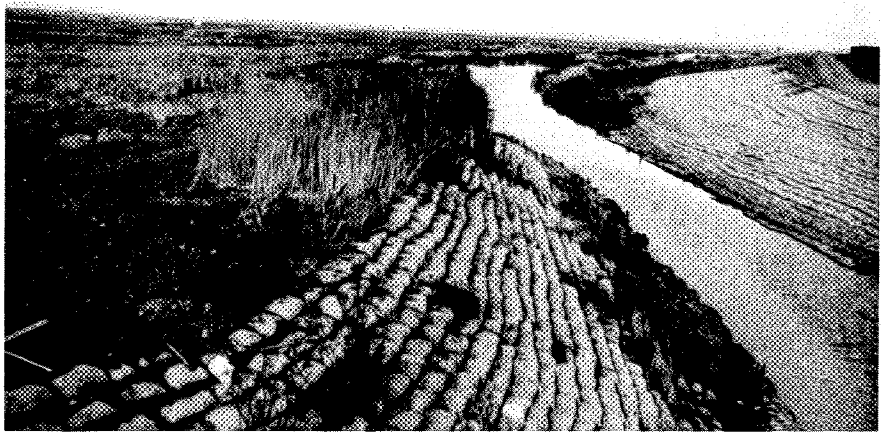
Figure 5F

10

A view into the southern part of the Flood Basin.

11

Adobe Creek as it flows into the Flood Basin.



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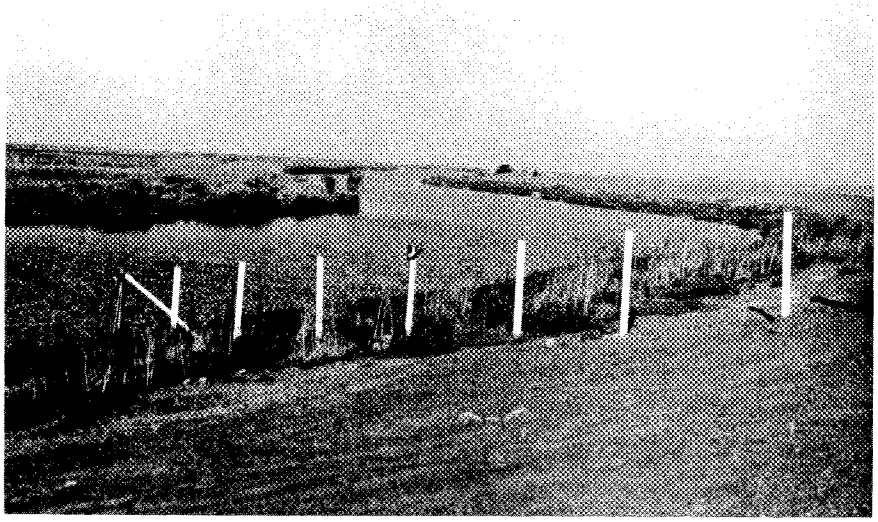


Charleston Slough linking Adobe Creek with South San Francisco Bay.

For location and direction of these photographs, refer to Figure 5C.

Figure 5G

Alto Open Space Element (1973, p. A-18) include: "Flat and open, tall grasses and occasional bushes emphasize meeting of distant horizon and sky; serenity and quietude prevail; sense of enclosure from levee; ever present distant view of alert and majestic egrets."

Bordering the Flood Basin are a number of professional and industrial one-story structures of a modern architectural style, the majority of which are concrete. Surrounding most of the buildings are paved and landscaped areas containing respectively, parking lots and non-native plants which are irrigated and reasonably well-maintained. Adjacent to the project site is the well-maintained Palo Alto Municipal Service Center (corporation yard) and Animal Shelter, surrounded by a chain link fence.

The grade rising away from the Flood Basin into the distant hills creates a backdrop for the visual space of the Flood Basin and also provides vantage points for views into the hills. Between the Basin and the distant hills lie the Bayshore Freeway and East Bayshore Road; behind these dominant visual elements, are the various industrial, commercial, professional, and residential community structures of the urban area. Other than a dirt shoulder, no buffer exists between the East Bayshore Road and the Flood Basin levees, although the Bayshore Freeway is partially screened by a narrow planting strip supporting various vines on a 6-foot chain link fence separating the Freeway from East Bayshore Road. Street trees have been planted along the Flood Basin side of East Bayshore Road.

Travelers on the Bayshore Freeway have only a limited opportunity view of the Flood Basin due to the chain link fence, vines, the fast travel speed, and the normal traffic volume. Drivers on East Bayshore Road, however, have a greater opportunity to view portions of the Flood Basin at a more relaxed pace. The visual activity of the driver, however, is still limited by the speed of travel. A low profile scene (subhorizon) such as the Flood Basin is less appreciated at auto travel speeds. The remaining visual amenities are a product of the air space over the Flood Basin which often contains cloud formations and a multitude of birds.

Visual amenities of the Flood Basin, of course, are more apparent and important to the many people who now walk and bicycle through the area and who see it from the inside, looking out.

B. ECOLOGY

1. Overview

The approximately 600-acre tract of land that comprises the Palo Alto Flood Basin was originally tidal salt marsh. Since the area was diked off to provide a holding basin for excessive storm water runoff, the effects of tidal action on the vegetation have been substantially reduced. The low-flow, deep channels are the only areas within the basin affected by tidal waters. The observable significant variations in the vegetation are apparently the direct result of elevation differences affecting the relative soil salinity and amount of tidal flushing. Fresh water inflows from Adobe and Matadero Creeks also play a distinct role in creating and maintaining the types of vegetation present. The Flood Basin performs the ecological functions of reoxygenation, photosynthesis and providing wildlife habitat.

2. Flora

Three major vegetation types or associations account for most of the Flood Basin area: annual grassland, pickleweed-fat hen (remnant salt marsh) and mixed riparian. The grassland covers about 60 percent of the Flood Basin with Italian rye grass as the dominant species. (See Appendices A & B for biotic reconnaissance and lists of major flora in the Flood Basin.) Other important species present in this association include ripgut grass, wheat and barley grasses, wild oat grass and *Heleochloa schoenoides* (no common name). The presence of these upland grasses is a direct result of secondary successional change due to altered environmental conditions. The exclusion of saltwater tidal action enables salt-intolerant grass species to take advantage of the upper soil which has been leached of salts.

The pickleweed-fat hen association is probably the remnant of the previously existing salt marsh. It is found at a lower elevation than the grassland and requires a specific minimum salt content in the soil. Other halophytes (plants restricted to saline soils) found with this association include frankenia, saltbush, sand spurrey, brass buttons, and salt grass. Some of the pickleweed is infested with the parasitic marsh dodder, indicating that at least some of the pickleweed may be growing under marginal conditions. This vegetation association is found in sinks and various abandoned channels immediately below the grassland elevations.

The third major association is mixed riparian (the term "mixed" is applied due to the origins of species present). Representatives of riparian communities, freshwater marsh communities, escaped introduced exotics and other naturalized weedy species make up this conglomeration of plant communities. The dominant plants are three species of willows, which are common to indigenous riparian communities in Santa Clara Valley. Coyote brush is also found closely associated with most of the riparian vegetation. This streamside plant community relies on the perennial freshwater supplied by Matadero Creek; the limited available freshwater restricts this community to the Flood Basin's northwestern fringe.

Several smaller groups of plant associations are scattered over a wide area in the Flood Basin. Some of those represented include freshwater marsh, dominated by cattails and bulrushes and large areas of mesic ruderal weeds (upland weeds of disturbed-soil conditions) such as poison hemlock, thistles, mustard, wild beet, cheeseweed, wild radish, and sweet fennel. Several areas are dominated by hydrophilic weeds such as spiny cocklebur, curly dock, and stinging nettle.

The freshwater marsh is located primarily along the Adobe Creek outfall into the Flood Basin, but is scattered into the riparian community also. Mesic ruderal weeds, as mentioned above, dominate the roadside levee slopes and other disturbed soil areas.

No rare, endangered or threatened plant species were observed or are known to exist in the Flood Basin itself.

3. Fauna

When sufficient rainfall occurs, such as 1974, the Flood Basin supports a great number of species and many individuals. The three major plant associations contribute to the diversity and multitude of higher animals present. The variety of plant species supports many insects and herbivores, thereby providing ample food sources for the carnivores.

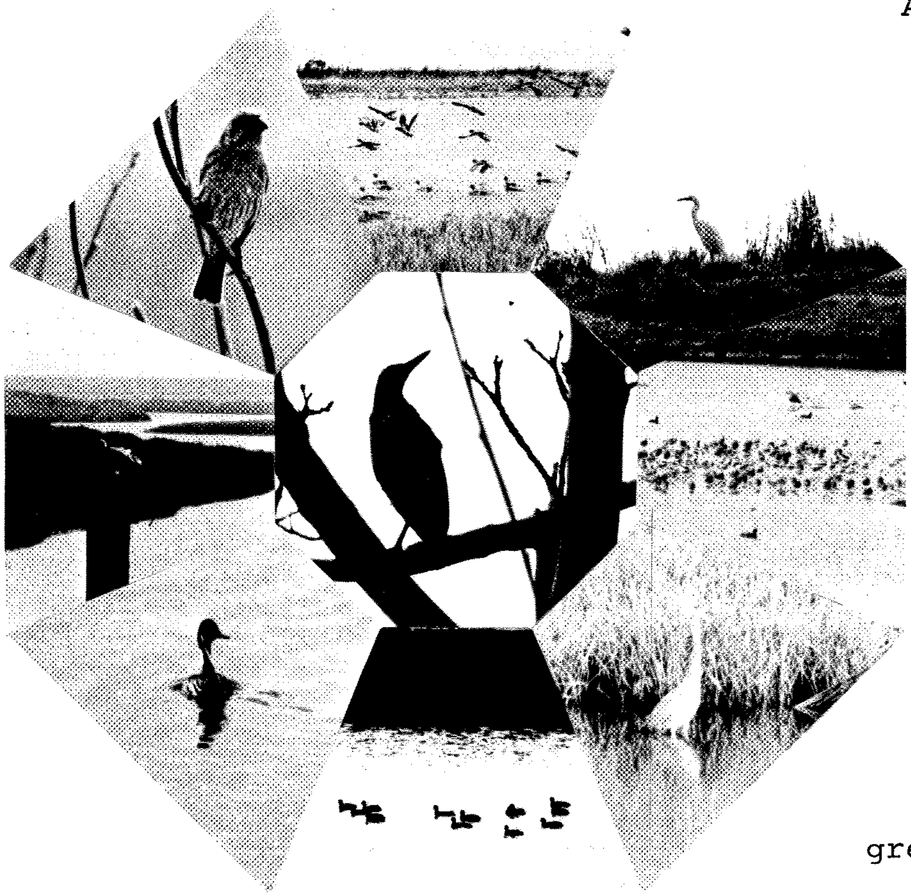
Much of the Flood Basin is subject to infrequent inundation, putting a severe seasonal strain on wildlife populations within this marshland preserve, by creating cyclic localized population explosions linked to rainfall patterns. Previous periods of heavy rains and flooding have decimated rodent populations upon which many predatory birds rely. These bird species include the common egret, great blue heron, hawks, kites and owls.

The latter three bird groups are more severely affected by heavy rodent losses because of their more specialized food requirements.

Wildlife field observations for this report were made in November 1974, a year of high wildlife populations. (See Appendices A and B for a list of observed animal species). Figure 6 shows some of the different birds observed during field work. The winter of 1973-74 produced a large standing crop of vegetation in 1974, making it a particularly good seed year. This, augmented by lack of inundation, resulting in unusually high rodent populations. Raptor numbers were also high, as evidenced by the many white-tailed kites, marsh hawks and sparrow hawks observed. Egrets and great blue herons also took advantage of the seasonal abundance of rodents to supplement their diet.

Large populations of ducks winter in the Flood Basin, as it is one of the few remaining major marsh areas left in Santa Clara County. San Francisco Bay is on the Pacific Flyway for many species of migratory waterfowl and is, therefore, critical to the continued survival of many bird species. The more common ducks observed included ruddy duck, mallard, pintail, cinnamon teal, shoveler and canvasback. Large numbers of American coot were also observed.

Fresh and brackish water habitats encourage several species of shorebirds to forage in these areas of the Flood Basin. Observed species include black-necked stilt, avocet, killdeer, long-billed dowitcher, lesser yellow legs and sandpipers. The



Partial Spectrum
of Flood Basin Birdlife

Figure 6

water habitats also attract red-winged blackbirds and at least four species of gulls. The sanitary landfill adjacent to the Flood Basin is a significant food source for the gulls, substantially supplementing their diets and contributing to their large numbers. They use the Flood Basin for a foraging and resting area.

The grassland plant association fosters populations of wildlife typical to many California upland meadows. These include large rodent populations, such as California voles. Large numbers of California ground squirrels exist, particularly in the higher elevation areas, such as the levees. Several black-tailed jackrabbits were sighted. Other rodent species are very likely present also. Many species of birds commonly associated with the grassland community have been seen; they include loggerhead shrike, western meadowlark, song sparrow and sparrow hawk. Scatological evidence also indicates the presence of rodent-eating carnivores, perhaps either canids (fox or coyote), or mustelids (weasel).

There was one quick sighting of what may have been a red fox. Although Martineau's study* (See Appendix B) does not indicate this area as known habitat, the possibility certainly exists. Sufficient cover and food sources are present to support a few individuals.

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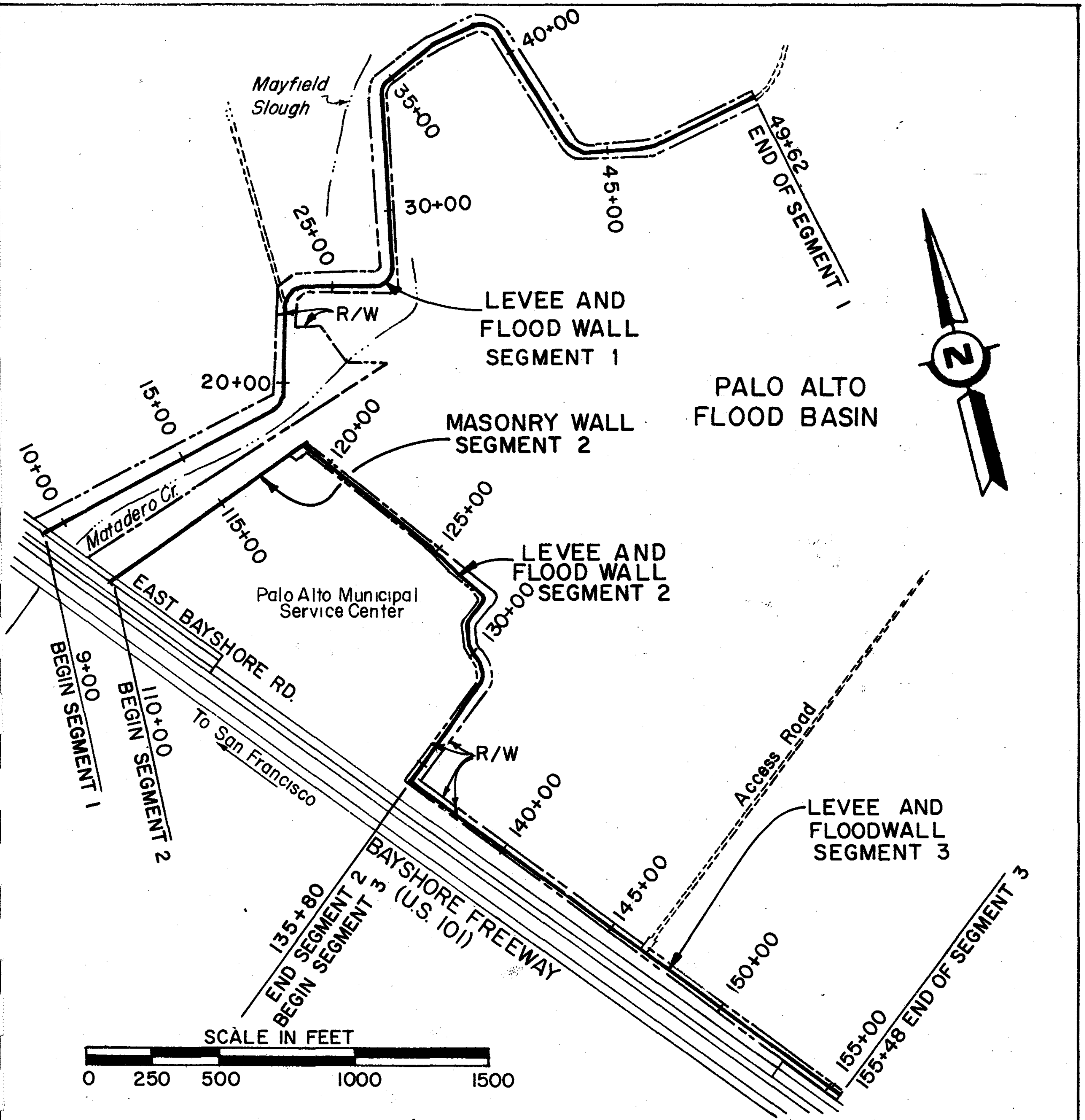
* Conducted by the Department of Nature and Science, City of Palo Alto independently of this EIR.

Unusual birds sighted were a single green heron, long-billed dowitcher, lesser yellow legs and Swainson's thrush, indicating a greater diversity of birds than perhaps previously known. The nearby Sand Point salt marsh (where the Palo Alto Baylands Nature Interpretive Center is located) is known to support a population of salt-marsh song sparrows, a locally threatened race which is restricted entirely to San Francisco Bay salt marshes. Positive identification of this race was not made in the Flood Basin, but since song sparrows were observed, a strong possibility of its presence exists. Sightings of at least six white-tailed kites in the Flood Basin indicated that this species is making a partial comeback, but it remains threatened by urbanization, as is the burrowing owl. One white pelican was sighted over the Flood Basin, landing in the adjacent salt pond to the east.

Although the pickleweed habitat does occur in roughly 30 percent of the Flood Basin, this particular habitat is not subject to direct tidal action; therefore, the existence of the endangered red-bellied harvest mouse is less likely, since this mouse is known to drink saltwater. No direct evidence of the mouse's presence was noted. No other rare or endangered species were observed, but it is likely that the endangered clapper rail and California least tern inhabit the area.

4. Ecosystems

Wide diversity of organisms and high biological productivity are perhaps the best ecological terms to describe the Palo Alto Flood Basin.



DATE 3-12-76	Santa Clara Valley Water District	SCALE 1" = 500'
DESIGN APM DRAWN mv CHECKED APM	FIGURE 5 RECOMMENDED PROJECT PLAN PALO ALTO FLOOD BASIN	

As previously indicated, the existing levee system eliminated all but minor tidal influence in the Flood Basin. Subsequent soil leaching by freshwater has altered the soil salinity substantially, causing an instability in the previous climax plant community. The resulting secondary successional changes have largely replaced the salt marsh with a grassland community, riparian associations and a mixture of garden escapes and introduced exotics. This floral diversity is responsible for the large diversity of wildlife. It would appear that this biologically rich area is the result of several ecotones (transitional areas between plant communities) that exist within the Flood Basin. Sufficient evidence is not available at this time to determine if a new level of ecological stability has already been achieved or if the area is still undergoing distributional changes in vegetation.

C. SOCIOECONOMIC SETTING

1. Community Goals and Plans

a. City of Palo Alto

The City's Open Space Element of the General Plan and new Comprehensive Plan, indicate current community policies, goals and plans.

The Flood Basin is dedicated parkland and a wetland preserve as recommended in the Open Space Plan of the City of Palo Alto.* Although its primary use is as a flood control facility, use of the Flood Basin as a wetlands habitat and wildlife sanctuary is of major regional importance, since it contains one of the few remnants of relatively undisturbed wetlands in the Bay Area. The Open Space Plan states:

> "The City has reevaluated the conflict between recreation and conservation uses in the Flood Basin, and has determined that flood control will be the primary purpose of the Flood Basin, and that preservation of wetland and wildlife habitat will be the secondary purpose."

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* City of Palo Alto Open Space Element, 1973, p.21

** Ibid., p. 22

To promote visual amenities, the new Comprehensive Plan recommends that "the vines planted on the east freeway fence (adjacent to the Flood Basin) should be removed in the future so that drivers (on Bayshore Freeway) will be able to see the Bay under the trees along the frontage road."* The Open Space Element of the City's General Plan (1973, p. 22) also recommends that the District and the City work together to improve the visual appearance of the levee system by using appropriate plant materials on the levees.

In the Open Space Element, goals and policies for recreation are enunciated. The City's stated goal is to provide "recreation activities and facilities in harmony with resources preservation." In the Flood Basin, the City's stated policy to achieve this goal is that "the use of dikes for hiking and bicycling should be encouraged with major regional recreational linkage utilizing inboard levees while retaining bayward levees for auxiliary paths and trails."** To help implement this policy, the District has agreed to modify gates to allow hiking and bicycling along the Flood Basin levee through the Charleston Slough area.*** It should be noted that the City's planning goals and policies for the Baylands are consistent with those of other public agencies, such as Santa Clara County, ABAG, BCDC, and the recently formed Mid-Peninsula Regional Park District (See ESI, 1975, pp. 93-101).

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* Palo Alto Planning Department, 1976, p. 49
** City of Palo Alto Open Space Element
*** Ibid., p. 22

Most recreational uses of the Flood Basin, such as bird watching, nature walks, photography, and limited retriever dog training are compatible with the planned two major uses of the Basin, i.e., floodwater retention and wetlands preserve. The present plant community provides a permanent habitat and nesting area for several species of waterfowl, shorebirds and mammals; it also provides wintering and resting grounds for many migratory waterfowl and shorebird species which complement the adjoining tidal marsh plant community.

b. Other Jurisdictions

The proposed project requires a fill permit from the U. S. Army Corps of Engineers, San Francisco District. The Corps has determined that the levee and floodwall construction will not have a significant impact on the environment. (U. S. Army Corps of Engineers, 1975). Therefore, no federal Environmental Impact Statement will be prepared for the project and the fill permit will be granted upon project approval.

The proposed project has been reviewed by the California Regional Water Quality Control Board, San Francisco Bay Region, to ensure that no excessive sediment and/or organic materials are deposited into Matadero Creek or other waterways.

They have determined that certification of this project is not required.

2. Land Use and Zoning

The existing District levees border most of the 600-acre Flood Basin located northeast of Bayshore Freeway between Matadero and Adobe Creeks.

Specific surrounding land uses include the City of Palo Alto Municipal Service Center and Animal Shelter adjoining Bayshore Freeway on the west, the Palo Alto Refuse Disposal Area and the undeveloped ITT property to the north, an industrial area to the west, and industrial and public lands across Adobe Creek to the south. (See Figure 7 for land use and zoning in this area).

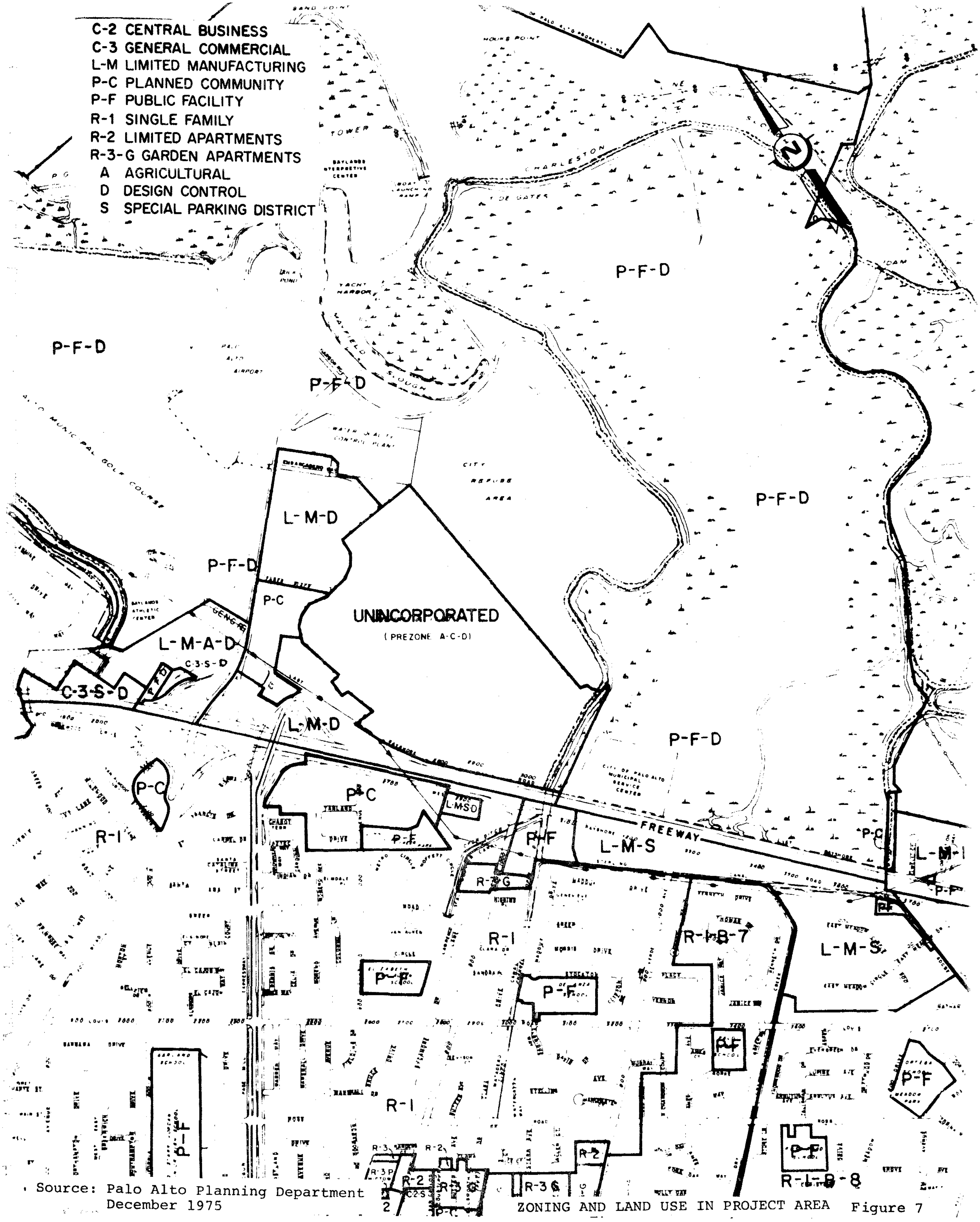
3. Population and Community Characteristics

a. Population

The 1970 census report estimated the population of the City of Palo Alto at 55,966 persons. This constituted 5.25 percent of the total population of Santa Clara County. The City's current population is estimated at about 56,000 (this figure includes the population of recently-annexed Barron Park).

b. Housing

Housing and income characteristics of the City of Palo Alto in 1970 showed an average of 2.7 persons per household, slightly lower than the 3.2 persons per household average in Santa Clara County. About two-thirds of the dwelling units in Palo Alto are single-family homes while about half are owner occupied. The median annual income of all households in Palo Alto (1974) was estimated to be about $15,000. About 4.2 percent of Palo Alto families were below poverty level, while 12.0 percent had incomes over $25,000, characterizing Palo Alto as a generally affluent city. (Palo Alto Comprehensive Plan, 1976).



Source: Palo Alto Planning Department
December 1975

ZONING AND LAND USE IN PROJECT AREA Figure 7

4. Public Services and Utilities

Urban services are provided to the project area by the following organizations and agencies:

Power	Pacific Gas and Electric Company
Water Supply	City of San Francisco (wholesaler) City of Palo Alto (retailer)
Sewage Treatment and Solid Waste Disposal	City of Palo Alto
Flood Control	Santa Clara Valley Water District
Parks and Recreation	Santa Clara County Parks and Recreation Department; Mid-Peninsula Regional Parks District; City of Palo Alto Parks Division & Recreation Dept.
School Districts	Palo Alto Unified School District and Foothill College District
Environmental Quality: Planning and Regulation	California State Department of Fish and Game; Bay Area Air Pollution Control District; Association of Bay Area Governments; Santa Clara County Health Department; U. S. Environmental Protection Agency; U. S. Army Corps of Engineers; City of Palo Alto
Fire Protection	City of Palo Alto
Police Protection	California State Highway Patrol; Santa Clara County Sheriff's Department; City of Palo Alto

5. Transportation

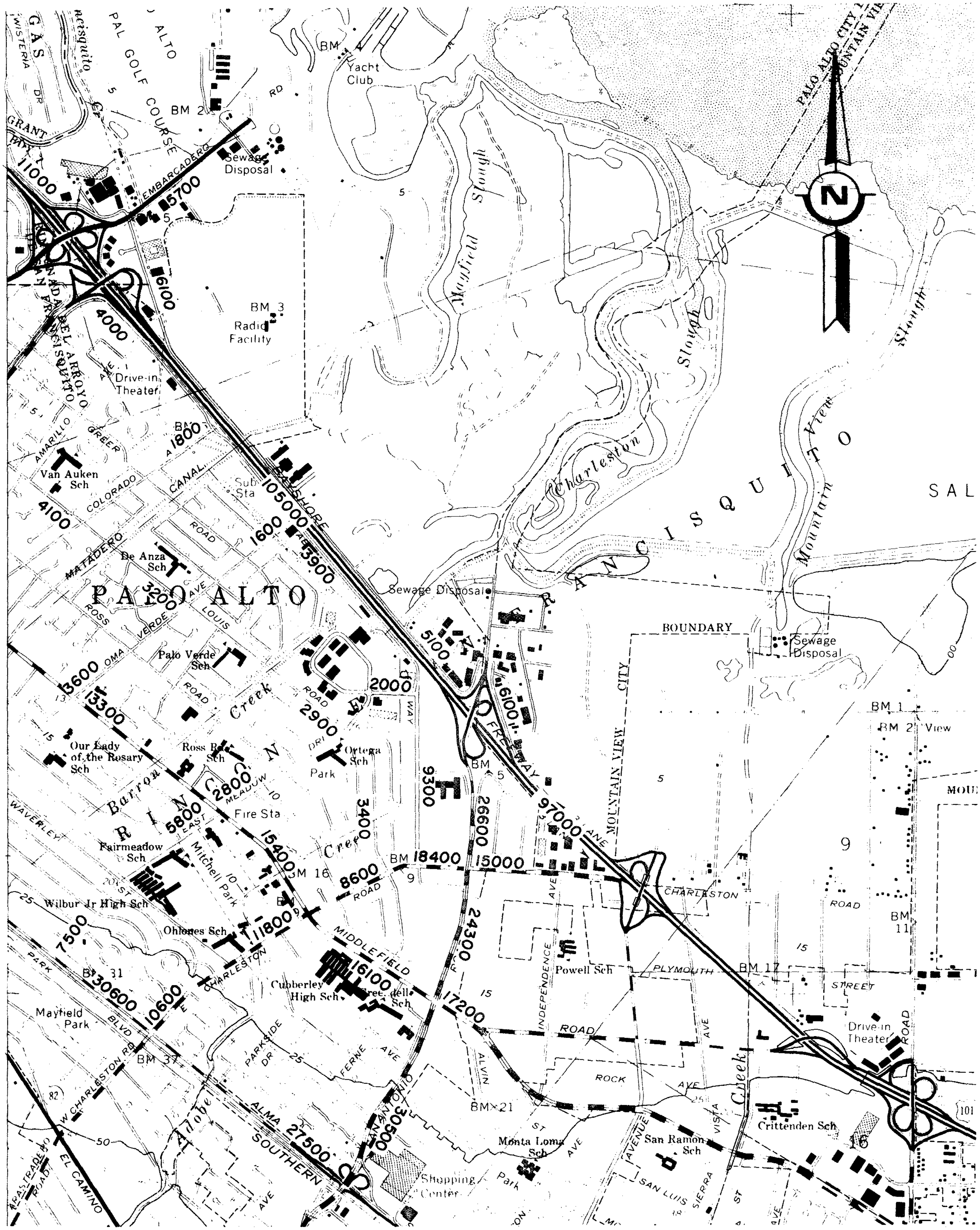
The primary transportation route serving the project area is East Bayshore Road; this secondary road runs in a northwesterly-southeasterly direction, paralleling U. S. 101 (Bayshore Freeway). This frontage road forms most of the Flood Basin's southwestern boundary. Traffic volumes recorded in 1974 on East Bayshore Road averaged 5100 vehicles per day near San Antonio Road (Palo Alto Comprehensive Plan, 1976, p. 22). See Figure 8 for 1974 Traffic Volume Survey.

Access to U. S. 101 is via the East Bayshore Road to either the San Antonio Road entrance to the south or the Embarcadero Road entrance to the north. There is a traffic signal at the intersection of Embarcadero Road and East Bayshore Road. This intersection is reportedly somewhat congested (ESI, 1975, p. 91). U. S. 101 links this area of Palo Alto to the northern peninsula and San Francisco; it also links Palo Alto to San Jose and southern Santa Clara County.

Much of the Flood Basin lies in the final approach landing pattern for the Palo Alto Airport of Santa Clara County, less than a mile to the north-northwest.

Access into the Flood Basin interior is gained by several dirt roads, which are subject to flooding during the rainy season since they are at a very low elevation. They are generally passable only for four-wheel-drive vehicles during the rainy season.

All levees surrounding the Flood Basin have maintenance roads on them. The newer levees have all-weather dirt roads, and



1974 TRAFFIC VOLUMES

Figure 8

Source: Palo Alto Comprehensive Plan

access is controlled by locked chain link fence gates. Levee access is restricted to the Santa Clara Valley Water District, PG&E, Leslie Salt Company and the local private hunting clubs.

6. Recreation

The Palo Alto Baylands area, which includes the project site, is used by many residents of Palo Alto and adjacent areas for recreational activities including bird-watching, nature walks, photography, retriever dog training, and bicycling. Illegal motorcycle riding occasionally occurs in the Flood Basin.

The Flood Basin interior is currently accessible by foot and vehicle from East Bayshore Road along most of the length of the proposed levee and floodwall. This access appears to be an inportant entrance for recreational activities in the Flood Basin interior. Upon completion of the project, access will be carefully controlled by the City of Palo Alto.

7. Archaeologic and Historic Resources

Because of the small area of land to be covered by the proposed project (approximately 6 acres) and because the proposed project would be built largely in an area already disturbed by previous construction, no impact on archaeological resources is expected. This conclusion is supported by the lack of archaeological resources in the adjacent 30-acre area proposed for sanitary landfill by the City of Palo Alto, as discussed in the EIR on that project (ESI, 1975, p. 61). Therefore, an archaeological reconnaissance of the proposed project site was judged to be unnecessary due to the low sensitivity of the project site.

D. RELATED PROJECTS, EXISTING AND PLANNED

1. Palo Alto Refuse Disposal Area

A landfill site operated by the City of Palo Alto for refuse disposal is located adjacent to Matadero Creek on the northern edge of the Flood Basin (See Figure 2). The City of Palo Alto has been granted a permit from the U. S. Army Corps of Engineers to fill an additional 40 acres of land beyond the City's existing landfill site (ESI, 1975). The effects of the landfill on the levee along Matadero Creek is discussed in the Geological Impacts Section (III-A.1). To mitigate the adverse environmental impacts of this new fill, the City has committed itself to attempting restoration of a portion of the Flood Basin to a tidal salt marsh (see below).

The future refuse disposal operations could affect the Flood Basin in the following ways: decrease the quality of ground and surface waters by possible introduction of leachates, degrade air quality near the filling operation, decrease the aesthetic and scenic values near the northwestern edge of the Flood Basin, adversely affect nearby vegetation by dust coverage, decrease wildlife habitat along Matadero Creek during the landfill construction periods and increase wildlife competition in the Flood Basin. (ESI, 1975)

2. Salt Marsh Rehabilitation in the Flood Basin

In April 1975, the Palo Alto City Council agreed to a one-year trial period for creating a salt marsh area in a small portion of the Flood Basin, as mitigation for the adverse environmental impacts of extending the Palo Alto Refuse Disposal

Area. This mitigation measure has the approval of the State Department of Fish and Game and the U.S. Bureau of Sport Fisheries and Wildlife.* A maximum saltwater level of -2.0 feet (MSL) was set for the first year of the salt marsh experiment; this water level results in frequent inundation of about 35 acres of upland meadow area inside the perimeter levees (WRE, 1975, Table 1).

Critical to the artificial reestablishment of cordgrass and pickleweed plant communities is the assumption that these species can indeed be grown in what is not now a tidal area. This situation in itself poses complex problems, because there are different substrata existing in the Flood Basin than these plants are normally adapted to. Early investigations into reestablishing such salt marsh vegetation have met with moderate success.** Existing soil salinity is substantially lower than that required by cordgrass, as indicated by the upland grassland community which occupies approximately 60 percent by area of the Flood Basin. The grassland plant species are not tolerant of saline soil. The existing distribution of pickleweed would probably change in response to renewed tidal action, likely by conforming to its normal distribution under tidal conditions.

Assuming that artificial reestablishment of the salt marsh is accomplished in a reasonable time period, changes in the wildlife species composition will certainly occur. Many species will be eliminated, to be later replaced by a largely different group of animals once the plant community became established and productive. A lag time, characterized by lower biological productivity, is anticipated for the changeover period.

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* Personal Communication, Mr. Ben Pawlowski, Palo Alto Public Works Department.

** Source: Dr. H. T. Harvey, 1975; San Jose State University (Personal Communication)

A study of the proposed salt marsh restoration project offered the following conclusions regarding the effect of that project on the use of the Flood Basin for flood control purposes (WRE, 1975, pp. X-1, X-2):

- "Operation of the Flood Basin for flood control purposes is not significantly affected by allowing reestablishment of tidal marsh conditions. Maximum flood level in the basin would not increase by more than 0.2 to 0.3 feet for the 100-year flood imposed on the basin after the tidal marsh is established and the equilibrium sediment depth is reached. The 100-year flood would still have a peak well below the 7 foot minimum levee height.
- "The impact of marsh restoration in the flood basin on bed load and suspended sediment moving down from the upstream watershed is negligible. Increased salinity in the basin will encourage deposition of suspended clay minerals, but the annual deposition should not exceed .075 feet. Dredging operations in Matadero, Adobe and Barron Creeks will not be affected significantly by marsh rehabilitation.
- "Suspended sediment inflow to the Flood Basin from San Francisco Bay would be significant. It is estimated to take one to two years for sediment deposition to reach equilibrium if the Basin is operated with a maximum water surface elevation of -1.5 feet MSL. Isolated depressions in the interior basin will fill to the -1.5 foot level. The main channels will be subject to some shoaling, but will maintain their present configuration under the influence of tidal circulation and flood flows. Equilibrium sediment depth in the main channels will be established below the -1.5 foot level."

In addition to these effects, it is possible that if a major portion of the marsh lands were allowed to revert back to a salt marsh, the potential for aggravation of the salt contamination in the upper aquifer zones will be increased. Although the upper aquifers are not pumped in the surrounding areas, a wider spread of contamination within the upper zones could result in potential contamination to the lower zones which are extensively pumped in the areas to the southwest.

3. Wastewater Reclamation and Groundwater Recharge Wells*

The Santa Clara Valley Water District is constructing a series of injection and extraction wells running in two lines roughly paralleling the Bayshore Freeway, about one-third mile east of the freeway. Four injection wells and three extraction wells and eleven smaller monitoring wells will be constructed in the Flood Basin interior for the purpose of recharging the shallow groundwater zone with reclaimed wastewater to repulse saltwater intrusion. This project would also provide information on the optimum operation of injection wells for possible future programs. It would be necessary to excavate trenches for pipes connecting all the wells to provide for reclaimed wastewater delivery and disposal and communication networks for the necessary electrical monitoring equipment. This excavation would parallel the line of wells and pass directly through the western levee on Matadero Creek, moving in a northwesterly direction. Since the feeder lines for the wastewater delivery pipe would be pressure-fed, excavation through the Matadero Creek levee would be deep, perhaps ten feet or greater. This well construction project is expected to be built before the proposed project is implemented.

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* Source: Santa Clara Valley Water District, 1973; Jenks and Adamson, 1974

Adverse impacts on plants and animals in the Flood Basin resulting from well drilling and excavation for wastewater delivery pipes will be largely short-term effects occurring during the construction phases of this project. Seven thirty-foot diameter earth mounds are proposed to keep the wells and monitoring equipment from inundation during the rainy season. Vegetation covered by the mounds will be primarily upland meadow grasses. These mounds will provide some additional habitat variation within the Flood Basin; this will be a minor long-term positive impact.

After the wells and equipment are in place, no additional significant adverse impacts are anticipated.

III. ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

A. PHYSICAL IMPACTS

1. Geology and Soils

As a result of raising the levee and constructing the floodwalls, the additional weight applied to the existing levee might cause some settlement within the existing levee and in the underlying bay mud. If it occurs, settlement would be very slow and would be expected to be minor; the weight of fill to be applied would be relatively small, the compressible section is small, and the existing levee has already been placing a load upon the existing bay mud over a number of years.

Erosion from storm water runoff would not be expected to present any problem since the flow velocity would be slow through the flat, sluggishly-draining Flood Basin. Minor levee erosion might occur from wind-driven waves when a large volume of water is in temporary storage. If this occurred, it could be repaired by normal maintenance procedures. Levee slope revegetation will help minimize any potential wave erosion.

The rate of sedimentation would continue as it has under previous operating conditions. Sedimentation results from the reduction of velocity of the turbid storm flows as the flows enter the flat Flood Basin and from overflow flooding as the flows spread onto the Basin floor. Sedimentation is a natural process; however, its rate has been increased by controlling the discharge to the Bay through tide gates. This increased sedimentation has also been aggravated by past land subsidence and could temporarily recur if land subsidence began again from future overdraft.

Portions of some of the slough channels might have to be excavated at periodic but infrequent intervals to provide normal flows through the tide gates.

Seepage through the levees or beneath the levee, which could cause a surficial nuisance condition in adjacent lands, would not be expected as long as there was not a prolonged high storage level. The clayey foundation of the Basin floor, properly constructed levees, and operation of the Flood Basin to drain rapidly any high level overflow flood storage waters would act together to inhibit the development of nuisance conditions.

By raising the levee, its stability would be decreased under ground shaking by a moderate or large earthquake. This reduction in stability will be mitigated by designing the levee embankment section with relatively flat slopes. Since the Flood Basin will not be further excavated, the earth fill construction materials for the proposed project will be imported; however, materials imported from outside the Baylands would be superior to excavated Baylands materials with regard to soil strength.

The purpose of the completed Flood Basin is to prevent local flooding. However, if a seismically induced levee failure were coincident with a major rainstorm, possible larger scale flooding of the surrounding lowlands might occur than with existing Flood Basin storage capacity. The probability of these events occurring at the same time is very remote.

If land subsidence began again, the likelihood of potential flooding would increase because of a decrease of the planned freeboard; the floodable area affected could increase due to the lowering of the inland areas.* However, it should be noted that the Flood Basin will be operated so that it would be empty most of the time and would rarely be filled to capacity.

Some areas along the northwest side of Matadero Creek (Mayfield Slough) might be relieved from potential flooding by the emplacement of sanitary landfill or by other filling of that area prior to urban development. The City of Palo Alto's sanitary fill currently abuts against a portion of the already completed levee section; the City proposes to extend its landfill operation southward, up to the proposed raised levee. However, if the construction of the sanitary landfill causes it to press against the raised Flood Basin levee, the fill would exert an inward lateral pressure against the proposed levee. Lateral pressure, combined with natural raising of the water levels within the sanitary landfill and a higher unfavorable seepage pressure (if groundwater slowly seeps from the sanitary landfill to Matadero Creek through the levee) could decrease the stability of the levee. In the event of localized levee failure from the increased lateral pressures or from seismic ground shaking, normal remedial repairs and maintenance would be required. Since high velocity flood flows within the Flood Basin are not anticipated, large amounts of sanitary landfill materials would not be carried away and scattered by the flows. The very small amounts of leachates that could enter the Basin during such an event would be greatly diluted by the streamflows and eventually carried away into the

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* However, it should be noted that the proposed 7.0-foot-high levees provide 2.4 feet of freeboard for wave action and possible future subsidence, so this problem is expected to be minor. (Santa Clara Valley Water District, 1974, p. 10)

Bay by subsequent flows, creating only a minor and temporary nuisance condition. Construction of a surface drainage system to carry off the local drainage from the landfill entering the Flood Basin would, in part, control the water levels within the landfill and reduce the production of leachates.

2. Water Quality

As previously described, land subsidence could affect the project. Programs to manage the groundwater basin are being undertaken by the District as part of a continuing effort to prevent adverse conditions such as subsidence and seawater intrusion from developing within the groundwater basin. One such program, mentioned earlier, is the series of recharge wells, using reclaimed wastewater, located at the southern end of the Flood Basin.

The proposed project would not alter tide gate operation thus preserving existing water quality. If tide gates were left open for increased two-way flow or were removed to allow the Flood Basin to return to a tidal salt marsh, current water quality conditions would be adversely affected. Under such an operation, stagnant waters in the sloughs would be more saline than at present and the possibility of increasing or aggravating saltwater intrusion in the upper groundwater zone would be increased. This may affect a small number of existing wells, since degraded upper zone waters could flow through defective wells to degrade the groundwaters of the unaffected lower aquifer zones.

If this sequence of activities led to significant deterioration of groundwaters in the lower zone, the following remedial actions, bolstered by the District's comprehensive well construction Ordinance would be required, including: constructing a hydraulic barrier in the upper zone to prevent seawater intrusion; initiating a program to restore water quality in the zone of intrusion; locating and properly sealing all abandoned wells and reconstructing improperly constructed or defective wells.

3. Air Quality

When completed, the project would not generate any air pollutants. Construction-related activity can be expected to release dust and particulates into the atmosphere, which might have a deleterious local effect on some plants and animals and may adversely affect a few nearby residences. Given the location of the project adjacent to the heavily traveled Bayshore Freeway, gaseous emissions from construction vehicles would have no significant effect on ambient regional air quality, but could have temporary localized impacts.

4. Noise

The proposed levee and floodwall system would improve the acoustical environment within the Flood Basin by reducing noise exposure levels for people and wildlife. (See Appendix C for the full text of the acoustical survey).

a. Extent of the Noise Reduction

As the proposed 3-foot-high floodwall paralleling East Bayshore Road would be constructed of concrete, this impervious wall would create an effective acoustical barrier to the propagation of noise. The estimated possible noise level reductions across the Flood Basin for the peak-hour traffic on Bayshore

Freeway of 9600 vehicles per hour are given in Table 3.

TABLE 3

L_{50} Noise Levels in the Palo Alto Flood Basin

for Peak Hour Traffic on Bayshore Freeway

Northeasterly Distance from Proposed Floodwall*, feet	L_{50} Noise Levels, dBA Existing	L_{50} Noise Levels, dBA With Floodwall	Net Reduction
100	69.2	65.4	3.8
200	67.0	63.3	3.7
400	64.0	60.4	3.6
800	60.5	57.0	3.5
1600	56.5	53.1	3.4
3200	52.3	49.0	3.3

* The proposed floodwall will be about 140 feet northeast of the Bayshore Freeway.

Table 3 shows that a noticeable 3.3 to 3.8 dBA noise reduction would be realized by constructing the floodwall. In engineering terms, a lowering of the sound level by 3.0 dBA reduces the energy of the measured sound pressure levels by one-half.

b. Importance of the Noise Reduction

Because the floodwall would cause a 3.3 to 3.8 dBA noise level reduction in the Flood Basin, less noise may reduce the area normally unacceptable to wildlife and for recreation.

First, an approximate definition of an area that is too noisy must be given. Most people, if given the opportunity, will seek lower noise levels if the absolute value is too high. For humans, the 70 dBA noise level experienced near heavily trafficked highways is actively avoided by most persons when possible. Only when the 55 dBA noise level experienced on residential streets is reached do most people not notice the noise, and voluntarily stay in the area. Similar behavior habits of some ducks in the Flood Basin were observed during the noise survey. The L_{50} (median) noise level of 56.7 dBA was measured at a location which was the same distance away from the center of a large flock of ducks floating on the open water in the Flood Basin. As there was sufficient open water around them, the ducks could have moved much closer to the Bayshore Freeway and still be surrounded by open water, but they apparently chose not to. A pair of egrets were also observed to fly in from the east, after being frightened by shotgun noises further east. They chose to get no closer to the freeway than 1,100 feet. This compares to the 1,050-foot distance selected by the ducks.

From the foregoing, it was tentatively hypothesized* that an acceptable noise level for humans, birds, and possibly other animals from intruding vehicular noise would be about 56 dBA. Without the proposed floodwall, this noise level means that an acceptable noise environment now exists at a distance of about 1600 feet or greater from the Bayshore Freeway during peak-hour traffic (See Table 3). However, if the proposed floodwall were built, the vehicular noise would be partially shielded, and an acceptable noise environment would then start 800 feet closer to the Bayshore Freeway. This 800-foot band across the approximately 0.5-mile width of the Flood Basin would result in the return of about 50 acres to a nominally acceptable noise environment.

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* It is recognized that factors other than noise could influence the preferred location of the resting and feeding area of the birds.

On a short-term basis, operation of heavy construction equipment during filling, grading and levee construction phases of the project would produce intermittent high noise and vibration levels in the immediate area, lasting about one construction season. This noise would disturb resident wildlife and recreation enthusiasts for less than a year. Birds might be less affected than more vibration-sensitive land animals.

5. Visual and Aesthetic Quality

The floodwall would present a visual barrier to portions of the Flood Basin and would add another element to the landscape - the wall itself. The levee would be raised to elevation +4.0 feet MSL and the wall would rise 3 feet above the levee to elevation +7.0 MSL. The wall would screen most of the Flood Basin from the view of auto occupants on East Bayshore Road and the Bayshore Freeway. The view from the Freeway is less important since vegetation planted on the chain link fence adjacent to the Freeway is designed to eventually screen the Basin from the view of motorists. The wall would not, however, obscure the distant horizon or limit the spatial quality of this view. See Figure 9 for the approximate visual impact of the proposed floodwall along East Bayshore Road.

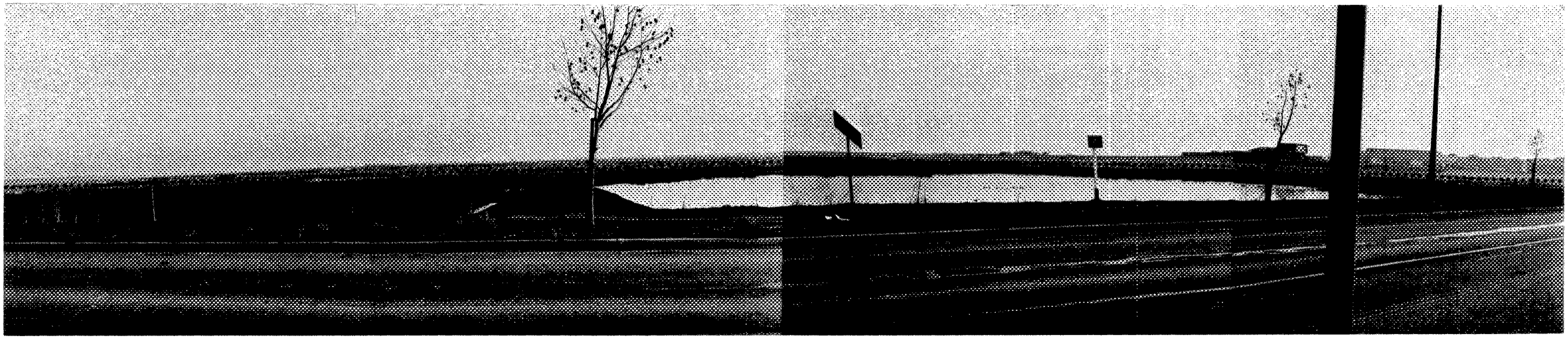
The vertical portion of the wall would be in the upper portion of the subhorizon view and would, therefore, obscure portions of the landscape that is now visible. A pedestrian walking next to the wall could see over it and would, of course, still have the opportunity to approach and enter the Flood Basin.

The wall would add a linear definition to the edge of the Basin, reflecting the parallel lines of adjacent roadways.

Although the wall will be built of concrete, it will not present a visually distracting element of its own, other than its monotonous linearity, color and perspective. Architectural relief surface treatment of the wall will help relieve some of this monotony.

The currently barren road shoulder would have the wall as a backdrop rather than the Basin vegetation, creating a barren and severe foreground in contrast to the existing view of the Flood Basin. Appropriate landscaping with native materials will reduce the undesirable qualities of such a combination and create a transition from the urbanized to the natural setting of the Basin. Proper architectural treatment of the wall will also help it blend better into the surroundings.

It should be noted that if the proposed floodwall were not constructed, a levee to the same height would be substituted; thus, the visual impact would be the same (the floodwall was selected to reduce filling of the Basin to a minimum).



Approximate Visual Impact of the Proposed Floodwall

The dotted horizontal line in the above photograph shows the approximate maximum height of the proposed floodwall. (Perspective distortion in this photographic composite makes the street, curb, dotted line and horizon appear curved.)

Figure 9

(Photographs courtesy of
Stephen Renfro, SCVWD)

B. ECOLOGICAL IMPACTS

1. General

The most significant impacts on the biological communities in the Flood Basin would be short-term stemming from construction activities. It is anticipated that the long-term impacts on the area would be minimal since very little work would take place within the Flood Basin itself.

2. Flora

Primary long-term impacts to the existing vegetation would be in the areas of levee construction. Approximately 1.2 acres of vegetation would be covered by the proposed Flood Basin levees. The majority of vegetation covered would be non-native annual and perennial weeds, such as poison hemlock, sweet fennel, thistles, mustard, wild beet, wild radish and cheeseweed. These ruderal weeds would reestablish themselves quickly under the conditions that would exist after construction. A 0.1-acre area of pickleweed growing in a drainage ditch north of the levee along Matadero Creek would also be covered by the new levee. This ditch only receives an infrequent water supply and has no connection with Matadero Creek or the Flood Basin. No destruction of vegetation or filling will occur on the creek side of the existing Matadero Creek levee where a productive riparian plant community thrives.

The southeast corner of the Palo Alto Municipal Service Center is a low area and would require about 3 feet of fill. Approximately 0.4-acre of land would be covered in this area by the proposed fill. A somewhat smaller area is vegetated primarily with upland ruderal weeds with patches of pickleweed similar to those mentioned above. Several tree tobacco shrubs would also be removed in this section.

Along East Bayshore Road, the only significant vegetation covered by the floodwall/levee construction would be along the northern half of the Flood Basin bordering East Bayshore Road where there are a mixture of upland ruderal weeds and fat hen. This area would involve covering approximately 0.7 acres of land, only part of which is vegetated.

It is difficult to predict accurately the exact amounts and types of vegetation to be directly impacted by the proposed construction. Such exact determinations are not considered necessary, considering the small total area involved and the types of plants to be removed. Most of the plants that would be affected by the proposed construction are weeds found in disturbed soil areas.

No major trees or large areas of significant native vegetation and no rare, endangered or threatened plant species would be affected by construction of this project.

3. Fauna

Construction activities can be expected to generate both long and short-term impacts on some animals in the Flood Basin. Expected short-term impacts include the displacement of ground squirrels and burrowing owls from their burrows in the existing levees. Removal of some weedy areas would reduce the food and cover for many species of animals, including rodents, pheasants and other seed-eating birds until reestablishment took place.

Loss of some pickleweed would result in loss of habitat and food sources for many rodents.

Noise and vibration from heavy equipment would drive many animals out of the area until construction is completed. Displaced wildlife would probably be eliminated if competition in other areas was too severe; however, the various affected species can repopulate the disturbed areas when sufficient habitat returns. The construction noise might create high stresses for more secretive wildlife species such as the great blue heron, which can be expected to move well away from the construction zone.

Short-term impacts might include the loss of some food sources for predators due to locally reduced prey populations. Until most bare soil areas revegetate, it is likely that erosion rates would increase slightly, adversely affecting water quality and, in turn, possibly affecting fish populations in Matadero Creek and adjacent sloughs slightly. Should this occur, reduced food sources would affect fish-eating birds.

Long-term impacts of the levees and floodwalls would be primarily limited to restricted movement of smaller terrestrial animals. The indirect impact of the floodwall would be a reduced rodent population intermixing which would tend to isolate the affected populations, both physically and genetically. This may affect the population dynamics of other species dependent on the rodents as food sources, such as the predatory birds; however, it is anticipated that this impact would be minor.

A large flood would trap and drown most small terrestrial animals within the basin if they were unable to scale the floodwalls.

4. Ecosystems

The more significant adverse effects on impacted plant communities would be short-term. Most of the vegetation removed by construction activities would return naturally within about two growing seasons. This revegetation period could be significantly reduced by the proposed effort to replant excavated and bare soil areas (see Mitigating Measures section). No significant long-term adverse impacts on existing ecosystems are anticipated from construction and operation of this project.

C. SOCIOECONOMIC IMPACTS

1. Land Use

The project would provide flood protection for persons, residences, businesses, industries, and public facilities within the floodable area from waters accumulating in the Palo Alto Flood Basin when all the design flows from Adobe, Barron and Matadero Creeks can get into the Flood Basin. With the threat of the 100-year flood eliminated, there might be slightly more development possible within the area. However, most of this section of Palo Alto is already fully-developed, thus completion of the project would probably not have a significant impact on surrounding land uses.

The Flood Basin would continue to be used as a flood control basin and its value as a wildlife preserve would be enhanced.

2. Population and Community Characteristics

The project will not dislocate any residences or businesses or have any direct effect on the size or composition of population in the area.

3. Community Goals and Plans

As discussed in Section II, Community Goals and Plans, the City of Palo Alto favors preservation of the open space and recreation provided by the Flood Basin and protection of the Flood Basin ecosystems.

Construction of the proposed project would have the following impacts on the above plans and goals: a) In conflict with the Draft EIR for the Palo Alto Comprehensive Plan, the view afforded by the Flood Basin by travelers along Bayshore Freeway and East Bayshore Road would be significantly impaired, resulting in an adverse impact on the visual experience of the Flood Basin's open space from these vantage points; b) vehicular access to the Flood Basin would be minimized; foot traffic along the levees would be the major access to the Basin. Whether this would be seen as a positive or negative impact on recreational activities would depend on the public's desire for use of recreational vehicles in the Basin. In terms of use of the Flood Basin as a wildlife preserve, the proposed floodwall would separate the Basin from traffic along East Bayshore Road from the Municipal Service Center, and, in general, from encroachment of human activity, thereby increasing protection of the Basin's natural environment.

4. Public Services and Utilities

It is not anticipated that this project would generate any long-term adverse impacts on existing public services or facilities. Upon project completion the potential for flooding from the 100-year flood and disruption of facilities and services at the adjacent Palo Alto Municipal Service Center would be removed.

5. Transportation

No long-term adverse impacts of this project are anticipated on the transportation networks mentioned in Section II.

Access into the Flood Basin interior might be restricted by construction of the floodwall along the East Bayshore Road, depending on the desires of the City of Palo Alto and the community.

Some short-term minor traffic disruptions might be experienced by drivers on East Bayshore Road and at the intersection of East

Bayshore Road with Embarcadero Road due to the frequent movement of equipment and materials during project construction.

6. Recreation

During the nine-month construction period, noise from the operation of the construction activities will disturb persons using the Flood Basin for recreational purposes. In particular, bird-watching, nature study and enjoyment of the natural serenity of the area would be disrupted near the construction areas. However, the floodwall would benefit these activities in the long run by reducing noise levels in the Flood Basin.

A long-term beneficial effect would be to minimize vehicular traffic inside the Flood Basin. This could be considered an adverse effect on those few persons who feel that driving in a wildlife preserve is recreation and should be allowed; but, it would be a beneficial effect for those who feel vehicular traffic does not belong within such a preserve. With one access road and parking area along East Bayshore Road provided, the recreationist could still use the Basin for nature walks and study, bird-watching, photography and retriever dog training without disturbing the basic functions of the preserve.

7. Archaeological Resources

Unless an unlikely subsurface discovery is made during project construction, the proposed project should have no impact on archaeological resources. A professional archaeologist would be retained by the District should a site be uncovered during construction.

IV. UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES PROPOSED TO MINIMIZE ADVERSE EFFECTS OF THE PROJECT

A. SHORT-TERM (CONSTRUCTION-RELATED)*

1. Impact

Noise from construction activity could affect recreation and disturb wildlife in the area around the project site.

Mitigation

All motorized construction equipment should be equipped with effective, properly maintained mufflers. Construction schedules should minimize the amount of equipment on-site and running at any one time; equipment should not be left with engines idling unnecessarily.

2. Impact

Particulate emissions, especially dust from filling and grading operations, could affect vegetation and disturb some recreational uses of areas adjacent to the Flood Basin.

Mitigation

All roads and bare soil areas will be sprinkled with water as necessary to reduce dust. The amount of bare soil areas exposed at any one time should be minimized. Bare soil areas should be replanted with appropriate plant materials as soon as construction in each area is completed. All motorized construction equipment should be kept properly tuned to reduce engine-generated air pollutants.

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* The Contract Specifications for the flood control work will specify abatement of noise, dust, gaseous emissions, chemical materials, water pollution, air pollution, spillage and preservation of all vegetation which is not desired to be removed. These Specifications will be rigidly enforced by the District. The Contractor's operation will be required to minimize the disturbance to wildlife, especially during their nesting season.

3. Impact

Visual and aesthetic values of the Flood Basin would be temporarily reduced.

Mitigation

During construction, no significant mitigation measures are feasible. However, the levees will be landscaped with vegetation as soon as possible after the flood control works are completed.

4. Impact

In general, some recreational uses of part of the Flood Basin would be reduced during the construction period.

Mitigation

These impacts cannot be avoided.

5. Impact

Some disruption of traffic on East Bayshore Road could be expected during active construction periods.

Mitigation

Maximizing the efficiency of vehicles in use could help reduce the number of vehicles on roadways at any one time. Traffic control measures will be provided by the City of Palo Alto.

6. Impact

Some animal populations would be displaced by construction noise and activity.

Mitigation

Minimizing construction noise as described in No. 1 above could reduce noise impacts. Construction activities may not be significantly mitigated to reduce its short-term impact on wildlife. However, proper construction schedules should minimize the impacts on the breeding seasons of resident and migratory bird life.

7. Impact

Small short-term increases in sedimentation in Matadero Creek could be expected as a result of project construction.

Mitigation

Construction will take place largely during the dry months to minimize erosion potential from bare slopes. Earth stockpiles and spoil areas should be protected from erosion during wet weather. The District will require the contractor to operate all equipment and facilities to maintain the present quality of water flowing through the construction site according to provisions in the California Standard Specifications. No petroleum products, chemicals, or other water-borne pollutants will be allowed to enter the Flood Basin as a result of the construction and/or related activities.

8. Impact

Project construction would require the commitment of earth masonry materials, other building materials such as concrete, aggregate and metal products; labor, energy and capital will also be required.

Mitigation

Although many of these commitments would be irreversible, the amount of energy consumed by project construction could be reduced somewhat. This would involve, principally, the reduction of fuel use in construction equipment through optimization of scheduling activities and through use of well-tuned engines. Minimization of off-site earth hauling through design features (e.g., balancing cuts and fills) could also help reduce unnecessary energy consumption.

B. LONG-TERM

1. Impact

Motorists on East Bayshore Road and Bayshore Freeway would permanently lose a view of much of the Flood Basin interior due to the construction of the floodwall.

Mitigation

Loss of the view of the Flood Basin interior cannot be directly mitigated. Special aesthetic treatment of the floodwall and landscaped vegetation will be incorporated, partially softening the floodwall's visual impact. The designs will be submitted to Palo Alto's Architectural Review Board for review. Landscape design will be done by a professional landscape architect, coordinated with Palo Alto's Bayland Planting Program.

2. Impact

About 1.2 acres of largely weedy vegetation would be covered by the new levees.

Mitigation

Landscaped plant materials will be selected from native and naturalized plant materials, including, where appropriate, trees, shrubs, herbs and grasses, ground cover and freshwater marsh plants. The intent of this landscaping program would be to provide a largely native plant community to improve the aesthetic values of the project area and benefit local wildlife.

3. Impact

Easy foot access to the Flood Basin interior from East Bayshore Road would be generally reduced to a few locations.

Mitigation

Adequate pedestrian and bicycle access to the Flood Basin could be maintained by appropriately placed steps and ramps.

V. ALTERNATIVES TO THE PROPOSED PROJECT

The major alternatives considered in development of the proposed project are discussed in detail in the Engineer's Report. A description of their design is, therefore, presented here only in summary form.

Such alternatives as increasing the Flood Basin area by acquiring more right of way or adding additional tide gates to the existing system for more discharge to the Bay were ruled out since the benefits received from these methods would be far less than the costs of additional rights of way or the cost of additional tide gates. Increasing the size of the Flood Basin would not be compatible with the current land use planning for the baylands area. Additional flood gates were found to have very little effect on reducing the high water level in the Flood Basin.

A. NO PROJECT

The "no project" alternative would leave an urbanized area of Palo Alto exposed to infrequent large floods from waters accumulating in the Palo Alto Flood Basin when all the design flows from Adobe, Barron and Matadero Creeks can get into the Flood Basin (whose magnitude would exceed the retention capacity of the Flood Basin in its present condition.) This alternative would eliminate the various adverse environmental impacts associated with the proposed project, discussed in Section III, but it would also eliminate the benefits of the project in ultimately providing flood protection as well as noise reduction and reduction of vehicle traffic in the Flood Basin itself.

A "nonstructural" alternative exists whereby residents subject to the 100-year flood could purchase federally-subsidized flood insurance under the National Flood Insurance Program. While offering some economic compensation to homeowners, flood insurance does not, of course, eliminate the damage and threat to health and safety resulting from major flooding. Also, the Bayshore Freeway would be subject to flooding and possibly become impassable under these conditions. Consequently, the District has judged that flood protection should be provided to this area of Palo Alto.

B. ALTERNATIVE STRUCTURES USING NATIVE EARTH FILL

An alternative project was considered using earth fill excavated from the Flood Basin to construct the levees either alone or in combination with a floodwall. The use of native earth fill would have involved a considerable loss of vegetation from the Flood Basin and would have significant adverse ecological impacts. Consequently, this alternative was rejected as being environmentally unacceptable.

C. ALTERNATIVE STRUCTURES USING IMPORTED EARTH FILL

Several alternatives were studies which used imported earth fill and, in some cases, a floodwall. The proposed project was one of these alternatives. By using imported fill, these alternatives avoided most damage to the vegetation of the Flood Basin, and were judged ecologically preferable. A floodwall-over-levee system along East Bayshore Road and around the Municipal Service Center was eventually chosen over a levee-only system or a floodwall-only system to minimize loss of valuable Flood Basin wildlife habitat, reduce costs, and to control vehicle access to the levee and the Flood Basin. The proposed project design was also the consensus of the Citizen's Flood Basin Study Committee who met with District staff over a period of time to assist in the planning process.

To maintain visual access to the Flood Basin for drivers along East Bayshore Road, serious consideration was given to raising East Bayshore Road to an elevation of +7.0 feet MSL, as described in the Engineer's Report. This alternative would require about 1,000 cubic yards less fill than the proposed project and would not affect vegetation in the Flood Basin. However, this alternative would have major adverse impacts on buried utilities, on traffic on East Bayshore Road during the construction period and would cause adverse noise, visual and aesthetic impacts to persons using the Flood Basin for passive recreational purposes. In addition, the view of the Basin from the Bayshore Freeway would be entirely blocked by the elevated road. The proposed project would also provide an additional vehicular lane off the main road for parking purposes which this alternative would not easily provide. On balance, the benefit of this alternative with regard to the view of drivers on East Bayshore Road was not judged significant enough to offset the added cost and construction problems.

VI. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

There would be almost no adverse effect of project on the long-term productivity of the local environment, either in its biological or social aspects. The project can be considered justified now because it is the first step in providing 100-year flood protection for the existing urbanized area in Palo Alto.

The project would require periodic routine maintenance of the levees, possibly including sediment dredging in the Flood Basin near the tide gates and in the lower reaches of Matadero, Barron and Adobe Creeks where they enter the Flood Basin.

Long-term project benefits, aside from ultimately providing 100-year flood protection, include noise reduction in the Flood Basin, and limitation of vehicle access into the Basin's wildlife conservation area. In addition to the cost of the project, there will be costs in the form of adverse environmental impacts (short-term effects resulting from project construction and long-term visual effects of the higher levees and floodwalls) and commitment of the 600-acre area to higher levels of flood water retention. The adverse impacts have been identified and discussed previously in this report. In the long-term, the project would have a beneficial effect on public health and safety.

VII. IRREVERSIBLE ENVIRONMENTAL CHANGES

The additional height of the levees and the use of the Flood Basin to receive floodwaters are basically irreversible changes, unless the perimeter levee system was removed entirely. Completion of the levee system will subject the Flood Basin to occasional inundation by large freshwater (flood) flows.

Construction of the proposed project would involve the commitment of earth and masonry materials, other building materials, labor, energy and capital.

The proposed project would cover about 1.2 acres of mostly weedy vegetation. This land coverage and associated construction activities would destroy or reduce populations of some animals and would change wildlife habitats in the construction area. Natural succession would, in time, restore some of the altered habitat, although different weedy species indigenous to the area may have a greater competitive advantage over those presently in the project area under the slightly altered conditions generated by this project. This situation could result in an invasion of the area by greater numbers of less desirable species than are now present. If such invasion occurred, the area could have slightly lower relative wildlife values than it does now, due to reduced diversity of species and greater amounts of introduced weeds of generally lower total food value for wildlife.

In addition, the approximately 25,000 cubic yards of proposed fill material would comprise soil and subsurface materials from the borrow site. The transfer of this material to raise the levees would represent an irreversible loss of resources at the source location unless fill was obtained from the site of some other project.

VIII. GROWTH-INDUCING IMPACT OF THE PROPOSED PROJECT

As discussed in the Engineer's Report, the area which this project would ultimately protect from flooding is a large urbanized area of Palo Alto southwest of the Bayshore Freeway. However this area is almost completely developed in urban land uses (residential and limited light manufacturing) and is zoned to maintain these uses. Other lands exposed to flooding northeast of Bayshore Freeway are either public facilities (e.g., Palo Alto Municipal Service Center) or areas zoned for wildlife conservation and open space uses. (The ITT property is zoned for open space.) Thus, it is very unlikely that completion of the proposed flood control project will induce a significant amount of further urban development in the 100-year floodplain of Palo Alto.

IX. AGENCIES AND INDIVIDUALS CONSULTED

City of Palo Alto

Ben Pawloski, Director, Public Works Department

Walter Anton, Engineer, Public Works Department

Elizabeth Crowder, Associate Planner, Planning Department

Larry White, Nature and Science Department

Miscellaneous Persons and Organizations

Ralph L. Turner, Jr., Consulting Engineer - performed the noise survey.

Dr. H. Thomas Harvey, San Jose State University - performed the ecological assessment.

Members of the Citizen's Flood Basin Study Committee

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XI. APPENDICES

A. "Observed Plant and Animal Species of the Palo Alto Flood Basin" by Winthrop A. Stiles III and Sharon Parker, SCVWD, November 1974.

B. "A Reconnaissance of Selected Biotic and Physical Aspects of the Palo Alto Flood Basin," by Robert T. Martineau, City of Palo Alto.

C. "Acoustical Survey of Project Site," by Ralph L. Turner, Jr., Acoustical and Vibrational Consultant.

D. Responses to Public Comments and Questions on the Engineer's Report and Draft EIR.

E. Storage Capability of the Palo Alto Flood Basin.

APPENDIX A

OBSERVED PLANT AND ANIMAL SPECIES OF THE PALO ALTO FLOOD BASIN

By Winthrop A. Stiles III and
Sharon Parker

SANTA CLARA VALLEY WATER DISTRICT

November 1974

OBSERVED PLANTS

Cheeseweed	*Malva parviflora*
Dwarf Mallow	*Malva rotundiflora*
Frankenia	*Frankenia grandifolia*
Field Mustard	*Brassica campestris*
Black Mustard	*Brassica nigra*
Wild Radish	*Raphanus sativus*
Lace-Pod or Fringe-Pod	*Thysanocarpus curvipes*
*Sand Spurrey	*Spergularia rubra*
Sea Fig	*Mesembryanthemum edule*
Curly Dock	*Rumex crispus*
Smartweed	*Polygonum* sp.
*Beet	*Beta vulgaris*
Fat Hen	*Atriplex patula* var. *hastata*
*Red Scale	*Atriplex rosea*
*Austrialian Saltbush	*Atriplex semibaccata*
*No Common Name	*Bassia hyssopifolia*
Pickleweed	*Salicornia virginica*
*Sea-Blite	*Suaeda californica*
Marsh Dodder	*Cuscuta salina*
Tree Tobacco	*Nicotiana glauca*
Peppermint	*Mentha piperita*
California Blackberry	*Rubus vitifolius*
California burclover	*Medicago hispida*
Black Walnut	*Juglans Hindsii*
Yellow Willow	*Salix lasiandra*
Red Willow	*Salix laevigata*
Arroyo Willow	*Salix lasiolepsis*
Stinging Nettle	*Urtica holosericea*
California Box Elder	*Acer Negundo* ssp. *californica*
Poison Hemlock	*Conium maculatum*
Sweet Fennel	*Foeniculum vulgare*
Fuller's Teasel	*Dipsacus fullonum*
Spiny Cocklebur	***Xanthium strumarium*** ssp.
Western Goldenrod	*Solidago occidentalis*
*Aster	*Aster chilensis* var. *sonomensis*
Coyote Brush	*Baccharis pilularis* ssp.
Brass Buttons	*Cotula coronopifolia*
Sagebrush or California Mugwort	*Artemisia vulgaris* var. *heterophylla*
Milk Thistle	*Silybum Marianum*
Thistle	*Cirsium* sp.
*Bull Thistle	*Cirsium vulgare*
*Italian Thistle	*Carduus pycnodephalus*
Barnaby's Thistle or Yellow Star Thistle	*Centaurea solstitialis*
Bristly Ox-Tongue	*Picris echioides*
Duckweed	*Lemna* sp.
Soft-Flag or Common Cat-tail	*Typha latifolia*

OBSERVED PLANTS (Continued)

*Ripgut Grass	Bromus rigidus
Salt Grass	Distichlis spicata var. stolonifera
*Wheat Grass	Agropyron junceum
*Barley Grass	Hordeum Hystrix
Italian Rye Grass	Lolium multiflorum
Wild Oat	Avena fatua
No Common Name	Heleochloa schoenoides
Goosegrass	Eleusine indica
Catalpa Tree	Catalpa sp.

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* As reportedly identified by Sam Earnshaw and Ron Richman in their Floral Reconnaissance of the Palo Alto Flood Basin, August 1974, as it appeared in the Preliminary Draft Environmental Impact Report on Palo Alto Refuse Disposal Area. This report was prepared by Engineering-Science, Inc., Berkeley, California, September 1974.

OBSERVED ANIMALS

Western Grebe	*Aechmophorus occidentalis*
White Pelican	*Pelecanus erythrorhynchos*
Mallard	*Anas platyrhychos*
Pintail	*Anas acuta*
Cinnamon Teal	*Anas cyanoptera*
Shoveler	*Spatula clypeata*
American Widgeon	*Mareca americana*
Canvasback	*Aythya ralisineria*
Turkey Vulture	*Cathartes aura*
White-tailed Kite	*Elanus leucurus*
Marsh Hawk	*Circus cyaneus*
Red-tailed Hawk	*Buteo jamaicensis*
Sparrowhawk	*Falco sparverius*
Ring-necked Pheasant	*Phasianus colchicus*
Snowy Egret	*Leucophoyx thula*
American Egret	*Casmerodius albus*
Great-blue Heron	*Ardea herodias*
Green Heron	*Butorides virescens*
American Coot	*Fulica americana*
Black-necked Stilt	*Himantopus mexicanus*
Avocet	*Recurvirostra americana*
Killdeer	*Charadrius vociferus*
Sandpiper	
Long-billed Dowitcher	*Limnodromus scolopaceus*
Lesser Yellowlegs	*Totanus flavipes*
Glaucous-winged Gull	*Larus glaucescens*
California Gull	*Larus californicus*
Herring Gull	*Larus argentatus*
Bonaparte's Gull	*Larus philadelphia*
Mourning Dove	*Zenaidura macroura*
Short-eared Owl	*Asio flammeus*
Burrowing Owl	*Speotyto cunicularia*
Belted Kingfisher	*Megaceryle alcyon*
Swainson's Thrush	*Hylocichla ustulata*
Loggerhead Shrike	*Lanius ludoricianus*
Meadowlark	*Sturnella neglecta*
Red-winged Blackbird	*Agelaius phoeniceus*
Brewer's Blackbird	*Euphagus cyanocephalus*
House Finch	*Carpodacus mexicanus*
Brown Towhee	*Pipilo fuscus*
Slate-colored Junco	*Junco hyemalis*
Song Sparrow	*Melospiza melodia* ssp.

OBSERVED ANIMALS (Continued)

Black-Tailed Jackrabbit	*Lepus townsendi*
California Ground Squirrel	*Citellus beecheyi*
California vole; meadow mouse; field mouse	*Microtus californicus*
Western Toad	*Bufo boreas*
Western Fence Lizard	*Sceloporus occidentalis*
3-Spined Stickleback	*Gasterosteus aculatus*
Mosquito Fish	*Gambusia affinis*

APPENDIX B*

A RECONNAISANCE OF SELECTED BIOTIC AND PHYSICAL ASPECTS OF THE PALO ALTO FLOOD BASIN

by Robert T. Martineau

Department of Nature and Science
City of Palo Alto

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Introduction

Twenty years ago the Palo Alto Flood Control Basin was closed off from normal salt marsh tidal fluctuation by the construction of tide gates and dikes. In the intervening years substantial changes have taken place in the biotic communities which inhabit the area due to changes in salinity and the degree of inundation and water circulation that the areas are subjected to. Several of the physical and biotic aspects of the Flood Control Basin which appeared to have been affected by changes in the tidal regime have been briefly examined to see what their present condition is and to provide a minimal estimate of how these will change with the proposed future changes in the tidal flow pattern. It would be possible to expend a great deal of additional energy, with positive benefit, in the areas that have been briefly touched upon here, the selected aspects of soil and mud, water, flora, and fauna. In addition subjects not even touched upon, including those of microscopic flora and fauna, additional aspects of water quality and detailed soil analysis, as well as soil and surface drainage patterns, could be investigated with the benefit being a better capability to predict changes in the Basin. The Flood Basin hardly resembles the natural salt marsh it once was, but the opportunity to provide a diversity of biotic environments makes this area worthy of considerable study and effort to maintain and enhance the viability that remains today.

Soil and Mud

The surface layer of soil in the Flood Control Basin consists of younger bay mud which is composed primarily of very fine clay particles. This mud varies considerably at the surface throughout the Basin partly due to differing quantities and types of organic matter, as well as the degree of soil compaction. Plants and animals are the source of organic matter which plays an important part in maintaining a beneficial soil environment for living organisms. Large amounts of decomposing materials are usually present in undisturbed grasslands and marshes, both as detritus, the recognizable partly decomposed remains of plants and animals, and as humus, the organic remains after they have been utilized by soil decomposers. The difference between the two emphasized here is that detritus is usually visible to the naked eye while humus may not be. In the adjacent salt marshes immediately outside the Basin, one finds on visual inspection where plants are growing, a thick mat of decomposing material which helps support a mud of relatively low density. In the Flood Control Basin in places one also finds soil which contains large amounts of detritus. The undisturbed grasslands and old channels which have standing water have large amounts and are relatively uncompacted. However, along roadways, along the edges of the large dredged channels, and in the disturbed areas near the frontage road, as they are shown on the accompanying maps, little decomposing materia is visible in the uppermost soil layers. The clays as a result have become very dense and compacted with a density that mimicks potting clay. Re-establishment of the proper soil regime in disturbed, compacted areas where salt marsh or grassland is desired will be a difficult process because the compacted muds do not return to their previous condition quickly. Many plants and animals will be unable to establish themselves in soil of this type. In addition to the brief visual inspection of soils for visible organic content, Cook Labs, Inc. is providing analysis of total organic matter content of soil and mud samples collected at several locations. Re-establishment of plant communities once found in the Basin will occur most likely in areas where organic content is high and soil bulk densities are low.

Soil and Mud Sampling

Site	Depth - ft.	Date	Comment
S1a	0-1	12/17/74	In slight depression, pickleweed vegetation
S1b	3-4	12/17/74	
S2a	0-1	12/17/74	Grassland vegetation
S2b	3-4	12/17/74	
S3	0-.5	12/19/74	Grab sample, mud from channel bottom
S4	0-1	12/17/74	At border of grassland and picklewe vegetation
S5	0-1	12/17/74	Compacted area, pickleweed vegetati
S6	0-.5	12/19/74	Grab sample, mud from channel bottom.

For exact location of sites see the map of sampling locations.

Over the years, rains and flood waters have leached salt out of the Flood Control Basin soils. Plants and animals have varying tolerances to salt in their environment, so leaching has played a major role in the change-over of large areas from salt marsh to grassland vegetation. In the future, large changes in soil salinities will cause changes in the plant and animal populations in the area, although, with the proposed tidal fluctuations such large changes are not expected. Cook Labs, Inc. is providing analysis of selected soil samples for salinity.

Samples are also being analysed for heavy metal content.

Water

Three aspects of water quality stand out in relation to proposed changes in the Flood Control Basin and the effect this will have upon living organisms in the area. They are the salinity, dissolved oxygen, and temperature.

On December 19, 1974 salinity and temperature readings were taken throughout the area. Rainfall was very low for the year (about 2.5 inches), therefore, salinities were not affected by fresh winter rain run off, as would usually be the case at this time of year. Readings were taken with a conductivity meter. Results from the various depths and locations are shown in the accompanying table and map. One interesting conclusion drawn from the sampling was that the sudden transition from brackish to fresh water at the head of the channels and the vertical stratification of salinity and temperature at each location indicates the low rate of mixing in the channels when the weather is dry. One of the ponds near the frontage road contrasts quite markedly from the other in salinity. During recent rains the fresh water pond has filled and overflowed into surrounding areas while the salt pond level has remained unchanged. The two ponds are separated by a raised roadbed which appears to prohibit water exchange between them. Roads, because the soil beneath them becomes compacted, can be expected to impede the flow of water in other areas of the Flood Control Basin.

Fluctuating the water level in the Flood Basin will probably not cause any major change in the salinities found in the area. Sea water has a salinity of approximately 32 parts per thousand (‰) but the value taken outside the tide gate at one high tide was 19‰ only slightly higher than the values inside the gate, as shown. At another high tide it was 12.7‰.

On December 30, 1974 dissolved oxygen and temperature readings were taken. Rain (about .5 inch) fell in the period from the 19th to the 30th so it is interesting that the temperature readings indicate that the temperature stratification throughout the channels had been upset during this time. The amount of dissolved oxygen in the water partly indicates the potential for oxygen requiring organisms to live there. Many fish, for example require a minimum of 4-5 parts per million (ppm) oxygen in their water in order to survive. Values taken that day indicate a high oxygen content in the water throughout the Basin. Values taken where dissolved oxygen is above 11 ppm are considered saturated. The values should be considered, however, in the light that they will change throughout the day at any one location, and that this particular sampling followed several days of windy, stormy weather which normally increases values. High values for dissolved oxygen, nearly equaling those outside the Basin indicate that tidal fluctuation will probably not significantly affect the present levels in the Basin. Day to day and month to month fluctuations in both salinity and dissolved oxygen due to causes independent of the tide gates (rainfall, winds) may bring about greater changes in values than the proposed tidal fluctuations, although, any increase in salinity may be beneficial to certain salt marsh organisms.

b-bottom
s-surface

Salinity (taken 12/19/74)

Site	Depth-ft.	Temperature- °C	Salinity- °/oo
1b		15	7
1s		14	1
2b		15	10
2s		15	2
3b	2	16	9
3s		15	4
4b	3	15	12
4s		13	9
5b	4	15.5	12
5s		14	10
6b	3	15	12
6s		12	10
7b	3	14.5	13
7s		13	10
8b	5	15	13
8s		11	10
9b	3	14	13
9s		12	8.5
10b	6	14	13
10s		11	10
11b	4	13	13
11s		10	9
12b	4	12	11
12s		10	8
13b	4	12	12
13s		10	10
14b	6	12	13
14s		10	10
15b	4	10	15
15s		10	11
16b	4	10	16
16s		10	11
17b	4	10.5	14
17s		10	11
18b	4	10	16
18s		9	11
19b	7	12	14
19s		10	11
20b	5	13	15
20s		12	11
21b	4	14	13
21s		13	10
22b	2	15	12
23b	1	14	12
24b	1	14	12
25b	1	12	2
26b	1	11	2
27b	1	10	2
28b	1	11	15
28s		11	18

Salinity (cont'd) 12/19/74

Site	Depth-ft.	Temperature- C	Salinity-
29b	1	10	3.5
30b	.5	11	1
31b	.5	13	8
32b	.5	11	13

12/27/74 10:00 a.m.

33b	10		12.7
$33s_1$			12.4

12/28/74 10:30 a.m.

$33s_2$			19

b-bottom
s-surface

Dissolved Oxygen (taken 12/31/74)

Site	Depth-ft.	Temperature-°C	D.O.-ppm
a-b		8	8.2
a-s	.5	8	9.2
b-b	4	8	8.6
b-s	.5	8	9.1
c-b	3	8	9.0
c-s	.5	8	9.0
d-b	3	7	10.4
d-s	.5	7	10.5
e-b	3	8	11.0
e-s	.5	8	11.0
f-b	5	6.5	10.3
f-s	.5	7	10.4
g-s	.5	7.5	10.3
h-b	4	7	9.2
h-s	.5	7	9.6
i-b		8	9.0
i-s		8	9.2
j-b	3	8	8.8
j-s	.5	8	9.3
k-b	.5	11	15+ (indicates algae)
l-b	.5	10	10.4
m-b	.5	12	10.2
n-b	1	10	11.8

Flora

There are seven major physical habitats in which plants gro[illegible] the Flood Control Basin. They are fresh water areas, brackish water areas, dry undisturbed areas, wet areas compacted by heavy equipment, old channels now silted up, raised road beds, and soil mounds. A reconnaisance survey has been carried out to determine what plant associations, if any, correspond to variations in the physical habitat. Plants throughout the area were identified, listed. and when it became evident that distinct lines did exist between various associations these were mapped out. Some difficulty was encountered in identifying annual plants for which there are few, if any, remains at this time of year (December). Therefore, these lists should not be considered as exhaustive, but indicative of the majority of types of vegetation found in the area. There are four vegetation types: two being major in extent, the grassland vegetation and the pickle weed vegetation, and two minor, the fresh water vegetation and the roadside and soil mound vegetation.

Pickleweed Vegetation

Pickleweed forms an association with other plants that dominates several physical habitats which are in low areas, often wet or saline, and unsuitable for other vegetation. Pickleweed vegetation is found in large flat areas compacted and depressed by heavy equipment, in old channels which are now partly filled with silt, and in brackish water areas, as well as other depressions. Plants found in the pickleweed vegetation:

Atriplex patula var. *hastata*	Fat Hen
Atriplex semibacca	Australian Saltbush
Cuscuta salina var. *major*	Alkali Dodder
Frankenia grandifolia	Alkali Heath
Salicornia pacifica	Pickleweed

In marshy channels these plants found additionally:

Cotula coronopifolia	Brass Buttons
Scirpus robustus	Prairie Bulrush

Grassland Vegetation

Grassland [illegible]on is found in the higher dry areas of the Flood Control Basin. The areas are generally flat, undisturbed, and relatively dry, most of the dalts of the old marsh having been leached from the soil. The slightest disturbance of this vegetation often results in the area being taken over by pickleweed vegetation. Plants found in the grassland vegetation:

Distichlis spicata	Salt Grass
Hordeum hystrix	Mediterranean Barley
Lolium multiflorum	Australian Ryegrass
Rumex crispus	Curley Dock
Sisymbrium officinale	Hedge Mustard

Fresh Water Vegetation

Fresh water vegetation occurs in areas where salinities are very low, and water stands all year. Vegetation in the channels is considered similar to that in the fresh water pond because of Cat-tails which dominate both areas.

Plants found in the fresh water vegetation:

		Barron and Adobe Creeks	Fresh Water Pond	Matadero Creek
Acer sp.	Maple			X
Atriplex patula var. hastata	Fat Hen	X	X	X
Baccharis pilularis var. consanguinea	Coyote Brush			X
Conzya canadensis	Horseweed		X	X
Cyperus eragrostis	Tall Cyperus			X
Echinochloa crusgalli	Barnyard Grass	X		
Juglans sp.	Walnut			X
Mentha spicata	Spearmint			X
Parapholis incurva	Sickle Grass	X		
Rubus urcinus	California Blackberry			X
Salicornia pacifica	Pickleweed	X	X	X
Salix sp.	Willow			X
Scirpus robustus	Prairie Bulrush	X	X	X
Senecio hydrophilus	Alkali Marsh Butterweed			X
Typha angustifolia	Cat-tail	X	X	X
Xanthium strumarium	Cocklebur		X	

Roadside and Soil Mound Vegetation

The roadsides and soil mounds in and near the Flood Control Basin have a similar vegetation, which consists of vegetation common to weedy and disturbed areas and found on high ground. Soil mounds are scattered throughout the area next to channels that have been dredged and in the middle of large flat areas. Plants found in the roadside and soil mound vegetation:

Artemisia douglasiana	California Mugwort
Atriplex patula var. hastata	Fat Hen
Atriplex rosea	Redscale
Atriplex semibaccata	Australian Saltbush
Avena sp.	Wild Oats
Beta vulgaris	Garden Beet
Baccharis pilularis var. consanguinea	Coyote Brush
Brassica campestris	Common Mustard
Brassica nigra	Black Mustard
Centaurea sestitialis	Yellow Star Thistle
Conzya canadensis	Horseweed
Dipsacus fullonum	Fuller's Teasel
Distichlis spicata	Salt Grass

Elymus triticoides	Alkali Rye Grass
Foeniculum vulgare	Fennel
Frankenia grandiflora	Alkali Heath
Lactuca serriola	Prickly Lettuce
Lavatera assurgentiflora	Malva Rose
Lepidium sp.	Pepper Grass
Lolium multiflorum	Australian Ryegrass
Picris echioides	Bristly Ox Tongue
Polypogon monspeliensis	Beard Grass
Parapholis incurva	Sickle Grass
Raphanus sativus	Wild Radish
Rumex crispus	Curley Dock
Scrophularia californica	California Bee Plant
Silybum marianum	Milk Thistle
Sisymbrium officinaie	Hedge Mustard
Suaeda californica	California Sea Blite
Taraxacum officinale	Dandelion
Vinca major	Periwinkle
Xanthium strumarium	Cocklebur

Plants growing on the dike near the tide gates:

Atriplex patula var. *hastata*	Fat Hen
Atriplex semibaccata	Australian Saltbush
Beta vulgaris	Garden Beet
Conzya canadensis	Horseweed
Cuscuta salina	Alkali Dodder
Frankenia grandiflora	Alkali Heath
Lolium multiflorum	Australian Ryegrass
Raphanus sativus	Wild Radish
Rumex crispus	Curley Dock
Salicornia pacifica	Pickleweed
Sisymbrium officinale	Hedge Mustard

In the future, allowing an increased flow of salt water through the tide gates will cause some changes in the present vegetation pattern of the area. Grassland is intolerant of salt, and will not survive where inundation occurs.

However, pickleweed vegetation which could become more abundant by taking the place of grassland, may be prevented from doing so by carefully regulating waterlevels to prevent flooding of grassy areas.

Roads and soil mounds will not be affected because they are above the level of proposed tidal influx. Fresh water areas may need some protection against raised salt water levels if this habitat is to be maintained.

Cordgrass does not presently grow in the Flood Control Basin. Increased circulation, and increased salinity will improve the chances that cordgrass can be successfully established in some of the old channels.

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Fauna

Ted Chandik, naturalist with the City, has provided lists of the various birds, mammals, reptiles, and amphibians in the Flood Control Basin. These lists were established over a period of time due to his, and other's, experiences in the area while bird watching. There are no known endangered species inhabiting the Flood Control Basin, although, Clapper Rails may wander occasionally into the area. Re-establishment of salt marsh in the Basin would provide a habitat for two local endangered species: the Clapper Rail, and the Salt Marsh Harvest Mouse. Some of the mammals, birds, and reptiles presently in the Basin are primarily adapted to the grassland community that has replaced much of the old salt marsh. Re-establishment of salt marsh will cause vegetation changes on some of this territory, and therefore, displace some animals permanently. Other animals will soon replace them. The maintenance of both grassland and salt marsh, as has been suggested, will increase the total diversity of life forms in the area.

Intertidal invertebrate animals play an important role in the ecology of salt marshes. Invertebrates consume bacteria and decaying plant material, converting stored energy to a form utilizable by other animals. Because they constitute a major bird and animal food source, the degree of their presence serves as an indicator of the viability of an area in supporting particular bird or animal populations. In order to get a very quick survey of the productivity of the Flood Control Basin areas that are presently marshy, several marshy locations were sampled for the presence of invertebrates. 250 ml. cores were taken from the top 3 cm. of mud where the water is about 2 cm. deep. The samples were washed in a 0.5 mm. screen. Debris remaining in the screen was very quickly surveyed for any invertebrates that were present. Several other areas providing habitats for certain invertebrates were also examined. Results are shown in the accompanying table.

The primary conclusion from a study of this limited depth arises in the observation that certain organisms were much more abundant outside the tide gates than within the Basin. Typical brackish water invertebrates were found inside the Basin but in very low numbers, perhaps because conditions are not optimum for them there, or because the sampling techniques were not adequate. However, some invertebrates were found in large numbers outside the tide gates, and were not found inside using the same technique. It can be assumed there is some difference in the two environments as far as these particular invertebrates are concerned. The fact that the Flood Control Basin is inhabited by a few of these invertebrates indicates that with improvement of circulation it may be possible to partly recreate an environment similar to that outside the gates.

WILDLIFE OF THE PALO ALTO FLOOD CONTROL BASIN AND ADJACENT AREA (CHARLESTON SLOUGH - IT&T PROPERTY)

MAMMALS:

VAGRANT SHREW
CALIFORNIA GROUND SQUIRREL
SALT MARSH HARVEST MOUSE - RARE, ENDANGERED SPECIES
CALIFORNIA VOLE OR MEADOW MOUSE
NORWAY RAT
HOUSE MOUSE
BLACK-TAILED JACK RABBIT

BIRDS:

DOUBLE-CRESTED CORMORANT
BRANDT'S CORMORANT - RARE - 1 RECORD
PELAGIC CORMORANT - RARE - 1 RECORD
GREAT BLUE HERON
GREEN HERON - RARE
LITTLE BLUE HERON - RARE - 3 RECORDS
COMMON EGRET
SNOWY EGRET
BLACK-CROWNED NIGHT HERON
LEAST BITTERN - RARE - 1 RECORD
AMERICAN BITTERN
WHISTLING SWAN - RARE - 1 RECORD
MALLARD - NESTS
GADWALL - NESTS
PINTAIL - NESTS
GREEN-WINGED TEAL
BLUE-WINGED TEAL
EUROPEAN WIDGEON - RARE
AMERICAN WIGEON
NORTHERN SHOVELLER - NESTS
REHEAD - RARE
CANVASBACK
GREATER SCAUP
LESSER SCAUP
COMMON GOLDENEYE - RARE
RUDDY DUCK - POSSIBLY NESTS
TURKEY VULTURE
WHITE-TAILED KITE
RED-TAILED HAWK
MARSH HAWK - NESTS
AMERICAN KESTREL
RING-NECKED PHEASANT
CLAPPER RAIL - RARE - ENDANGERED SPECIES
AMERICAN COOT
SEMIPALMATED PLOVER
KILLDEER - NESTS
BLACK-BELLIED PLOVER
COMMON SNIPE
LONG-BILLED CARLEW
SPOTTED SANDPIPER - RARE
WILLET

BIRDS: (CONTINUED)

GREATER YELLOWLEGS
PECTORAL SANDPIPER - RARE - 1 RECORD
LEAST SANDPIPER
DUNLIN
SHORT-BILLED DOWITCHER
LONG-BILLED DOWITCHER
WESTERN SANDPIPER
MARBLED GODWIT
AMERICAN AVOCET - NESTS
BLACK-NECKED STILT - NESTS
NORTHERN PHALAROPE
RED PHALAROPE - RARE - 2 RECORDS
GLAUCOUS-WINGED GULL
HERRING GULL
CALIFORNIA GULL
RING-BILLED GULL
MEW GULL
BONAPARTE'S GULL
FORSTER'S TERN
BLACK TERN - RARE - 2 RECORDS
MOURNING DOVE
BURROWNING OWL
SHORT-EARED OWL - NESTS
NIGHT HAWK - SP. - RARE - 1 RECORD
WHITE- THROATED SWIFT
VIOLET-GREEN SWALLOW
TREE SWALLOW
BARN SWALLOW
CLIFF SWALLOW
LONG-BILLED MARSH WREN
WATER PIPIT
LOGGERHEAD SHRIKE
STARLING
YELLOW-RUMPED WARBLER
YELLOWTHROAT
HOUSE SPARROW
WESTERN MEADOWLARK
RED-WINGED BLACKBIRD
TRICOLORED BLACKBIRD
BREWER'S BLACKBIRD
BROWN-HEADED COWBIRD
HOUSE FINCH
AMERICAN GOLDFINCH
SAVANNAH SPARROW
WHITE-CROWNED SPARROW
GOLDEN-CROWNED SPARROW
LINCOLN'S SPARROW - RARE
CLAY-COLORED SPARROW - RARE - 1 RECORD
SONG SPARROW
SNOWY PLOVER
COMMON SNIPE
WILSON'S PHALAROPE

REPTILES:

WESTERN FENCE LIZARD
ALLIGATOR LIZARD SP.
COMMON KINGSNAKE
GOPHER SNAKE

AMPHIBIANS:

WESTERN TOAD
PACIFIC TREEFROG

FISH:

THREE-SPINED STICKLEBACK
MOSQUITO FISH
THREADFIN SHAD

Invertebrate Reconnaisance   December 20, 1974

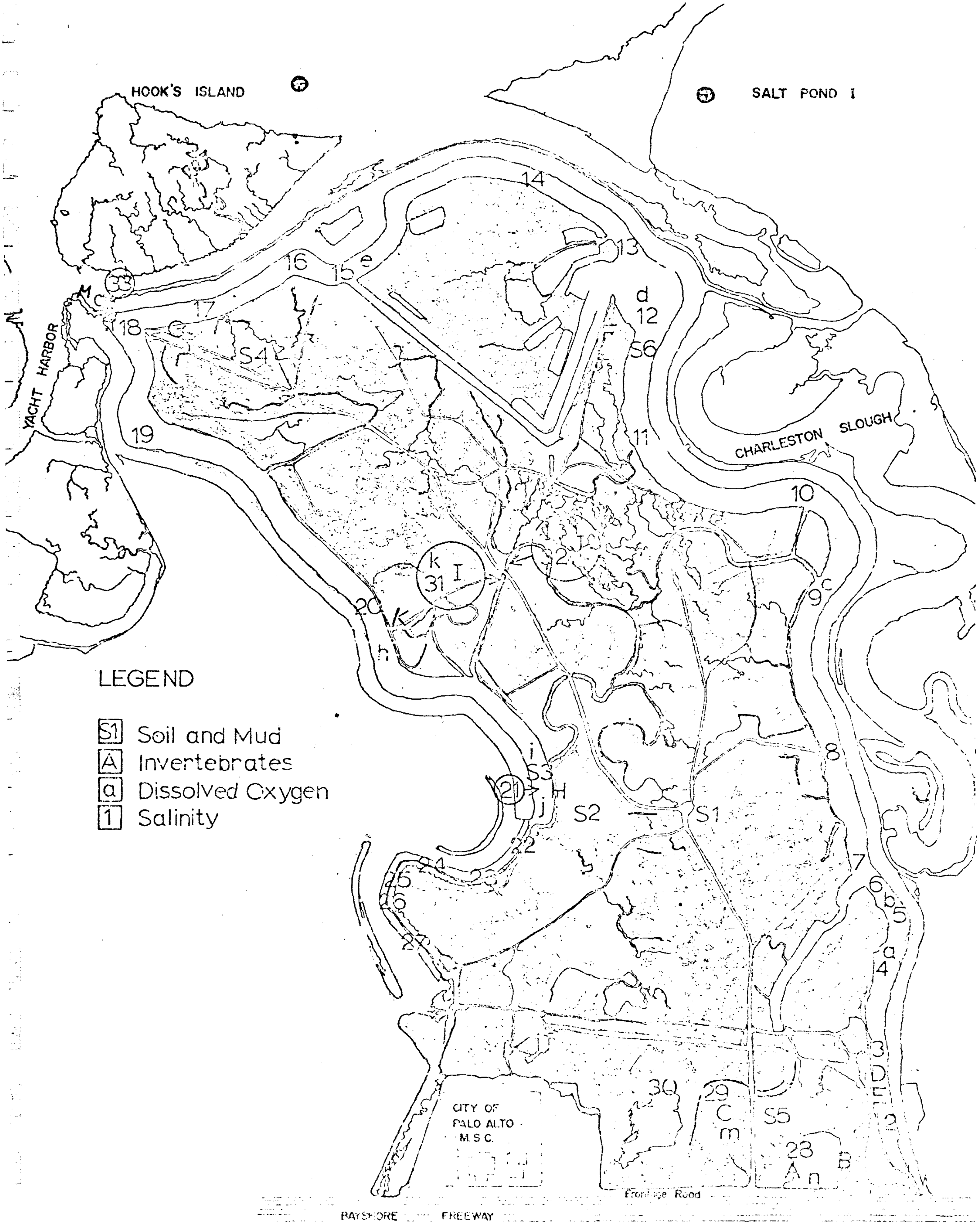
No screening or sieving of samples

Site	Substrate	Invertebrates
A	compacted mud, clay	polychaete worms (Polydora sp.) hydrophilid beetles
B	gravel mixed with mud	no animals
C	under boards in pickleweed	pulmonate snails planthopper nymphs (Collembola) psocids
D	compacted mud	no animals
E	on floating boards	small sponges copepods damselfly nymph
F	compacted mud	polychaete worms (Spionida) amphipods one isopod
G	compacted mud, clay	one copepod
H	compacted mud, clay	no animals
I	under a log in soft mud	large amphipods
J	soft mud	no animals

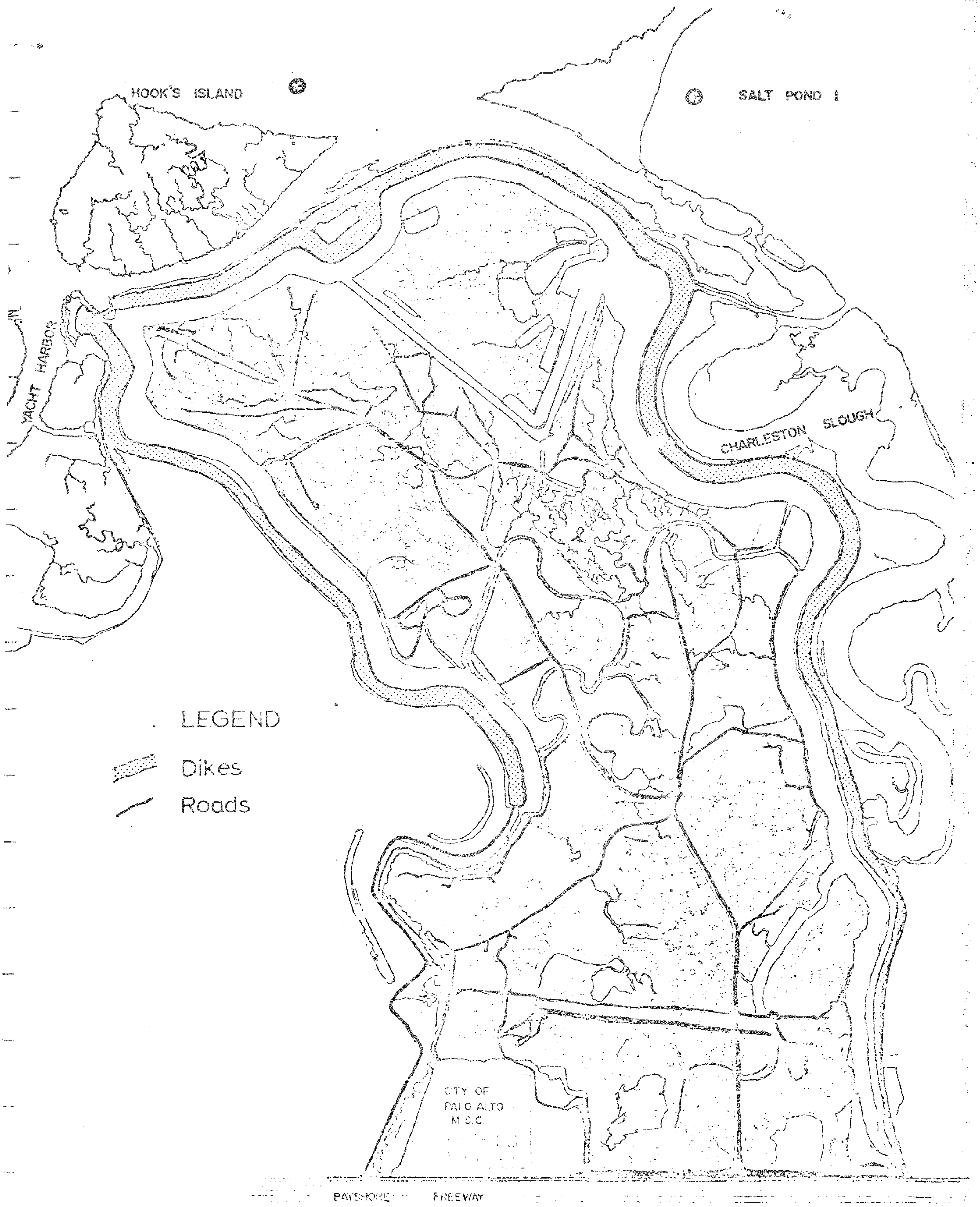
Invertebrate Sampling January 6, 1975

250 ml. samples screened in a 0.5 mm sieve

Site	Substrate	Invertebrates
D	compacted mud	one oligochaete worm
G	compacted mud	no animals
H	compacted mud	no animals
I	soft mud	several arthropods
K	soft mud	no animals
L	very soft mud	approximately 40 oligochaete worms 40 polychaete worms (*Eteone californica*)
M	very soft mud	approximately 20 oligochaete worms 400 polychaete worms (*Eteone californica*)



SAMPLING LOCATIONS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SALT POND I
YACHT HARBOR
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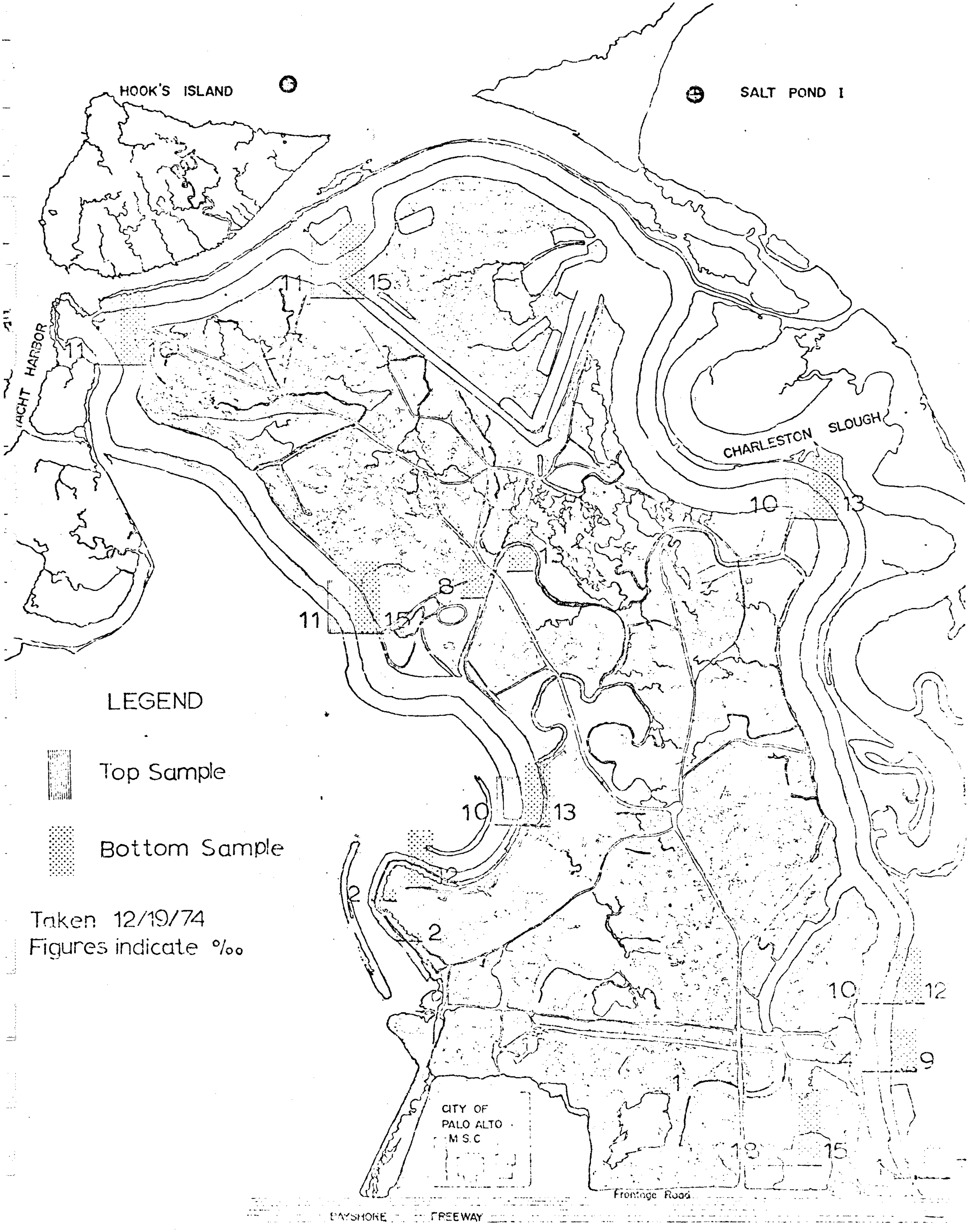
LEGEND
Dikes
Roads
CITY OF
PALO ALTO
M.S.C.
BAYSHORE FREEWAY


HOOK'S ISLAND
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CITY OF
PALO ALTO
M.S.C
Frontage Road
BAYSHORE FREEWAY
LEGEND
Top Sample
Bottom Sample
Taken 12/19/74
Figures indicate ‰

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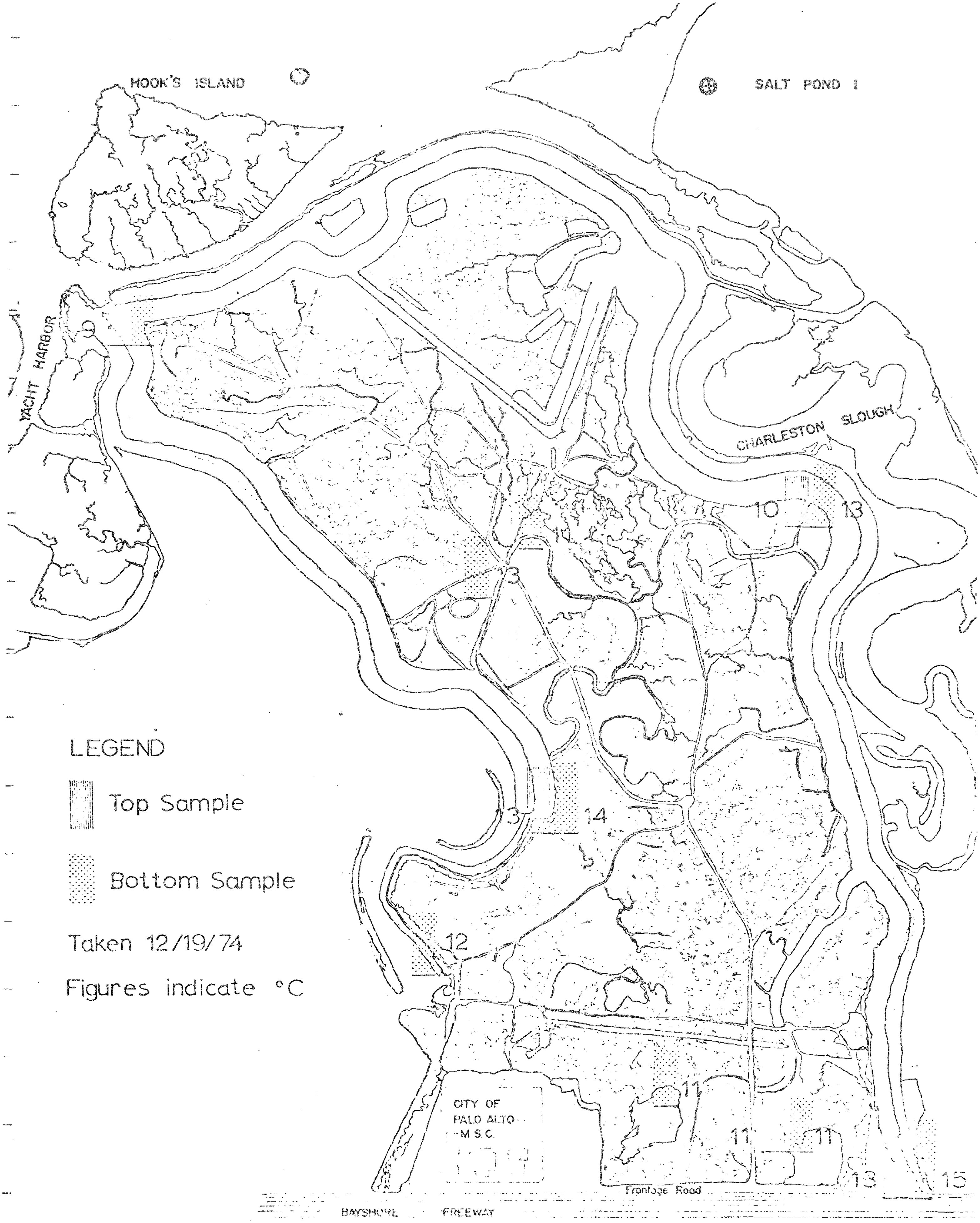

LEGEND

▥ Top Sample

▨ Bottom Sample

Taken 12/19/74

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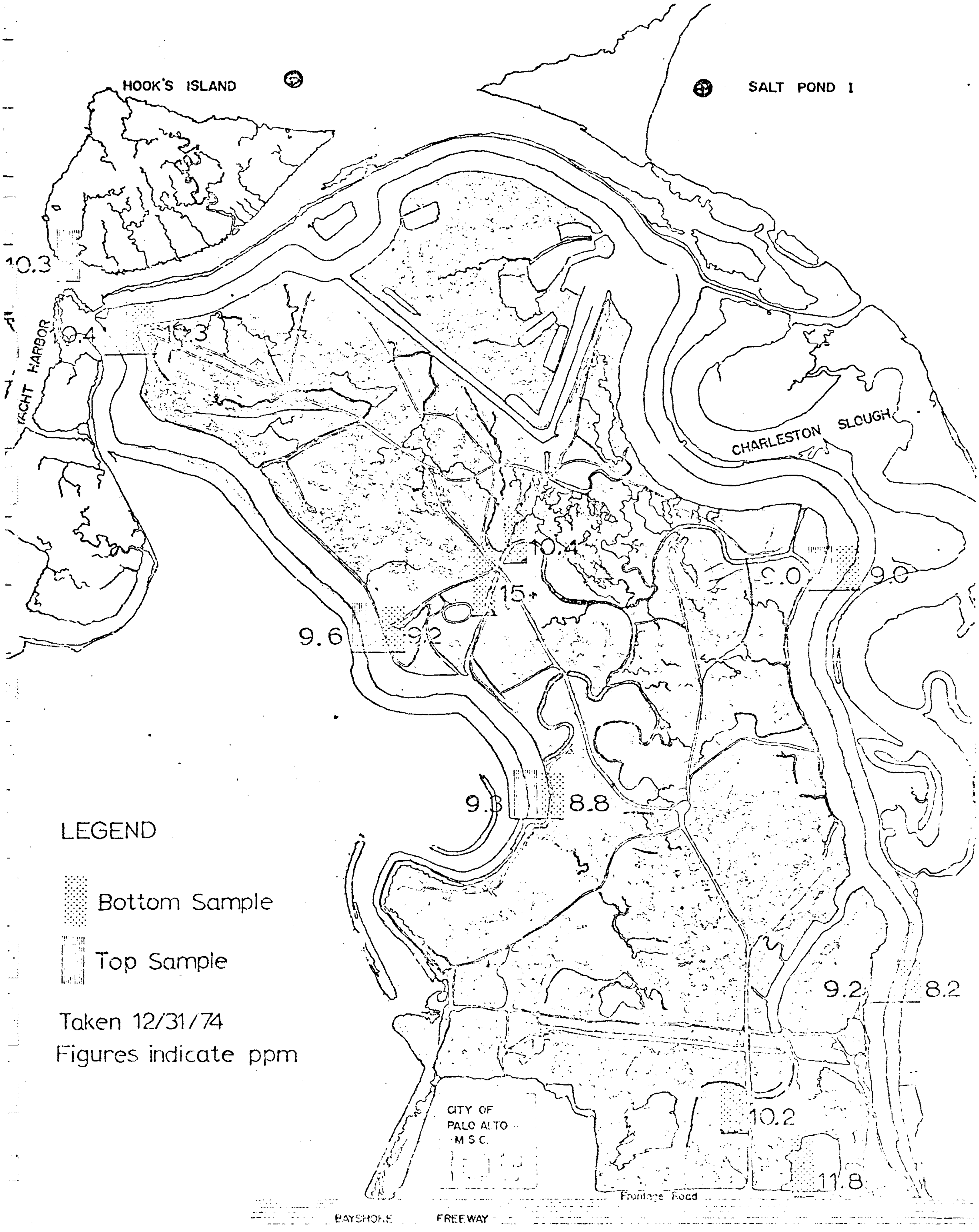

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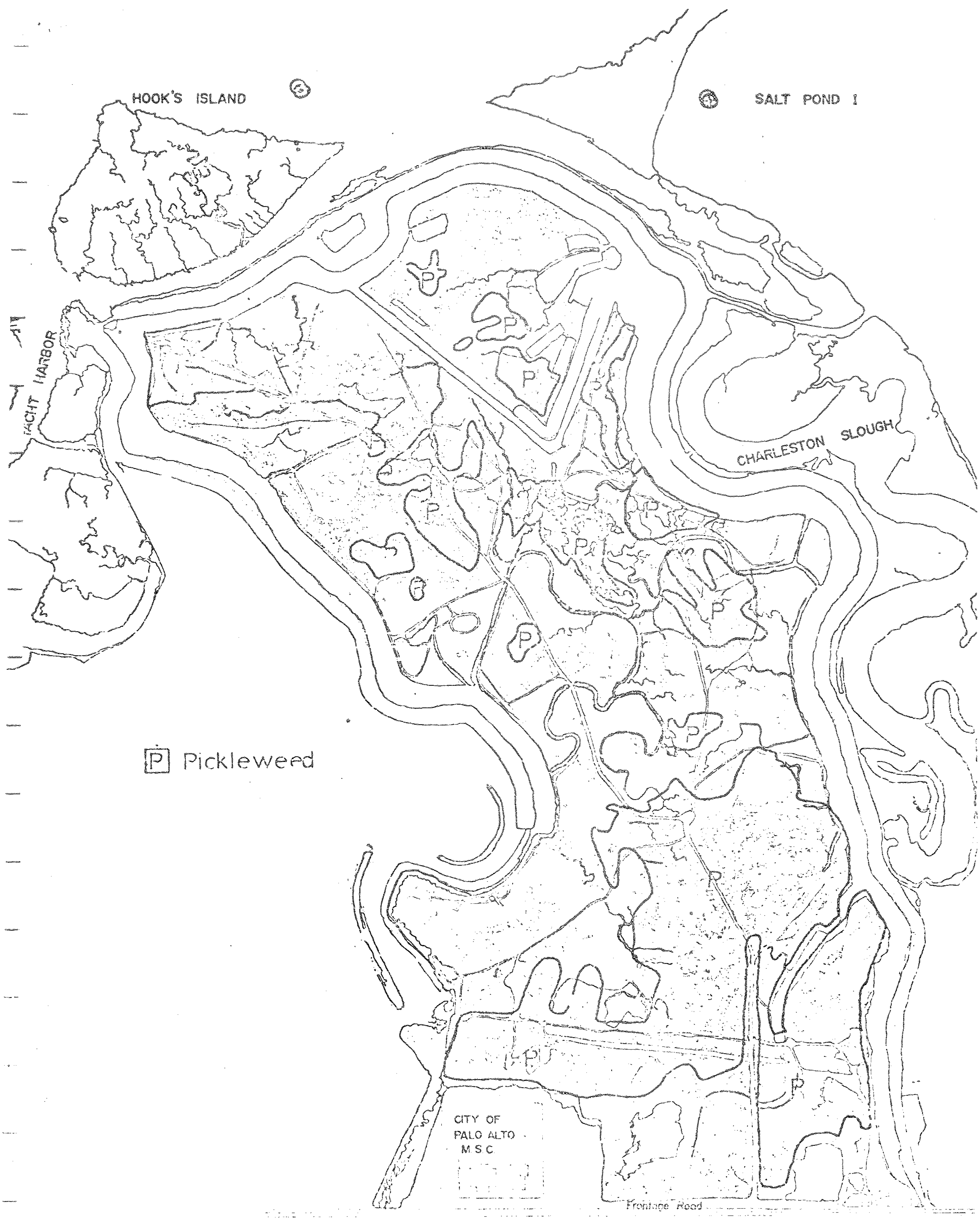
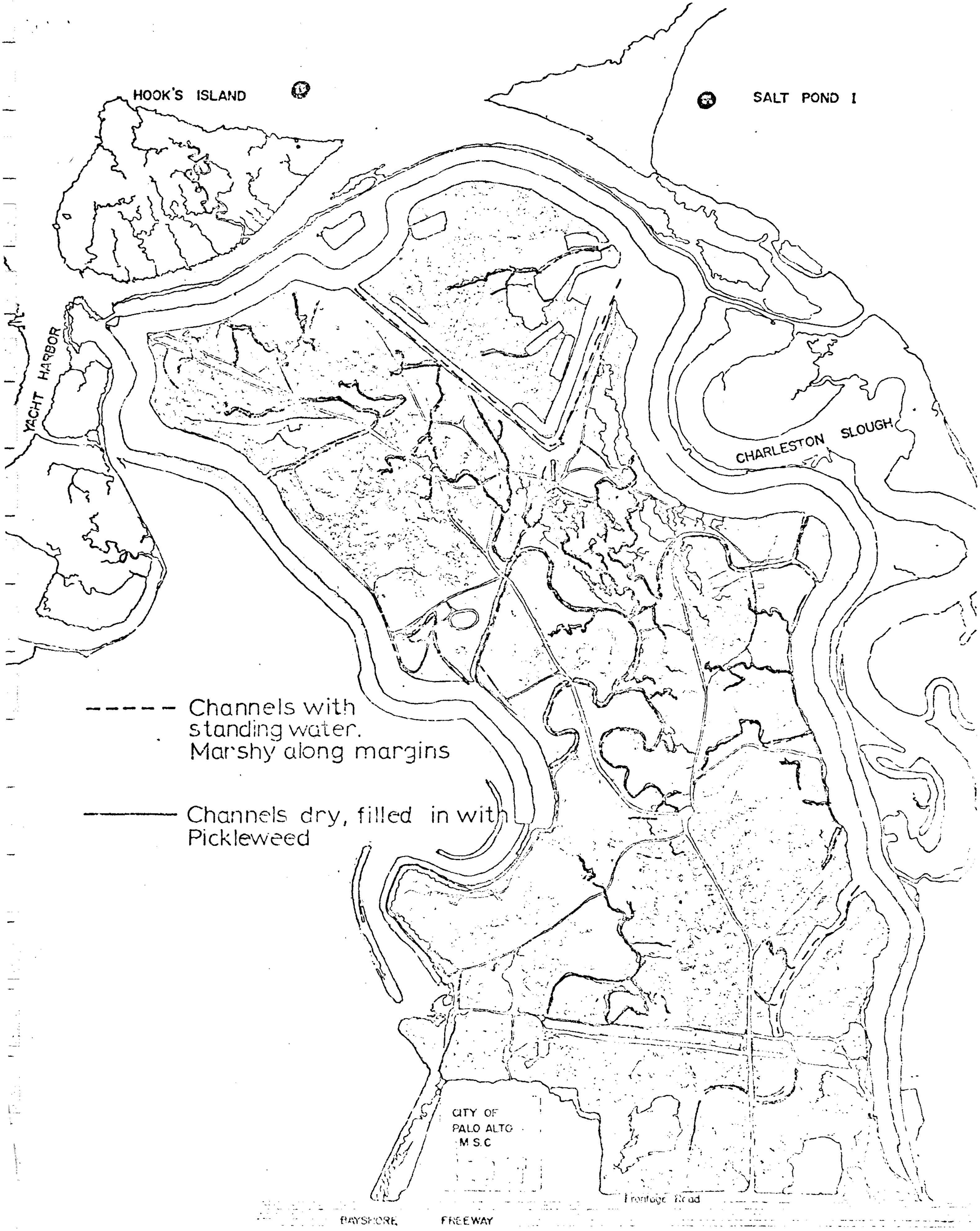
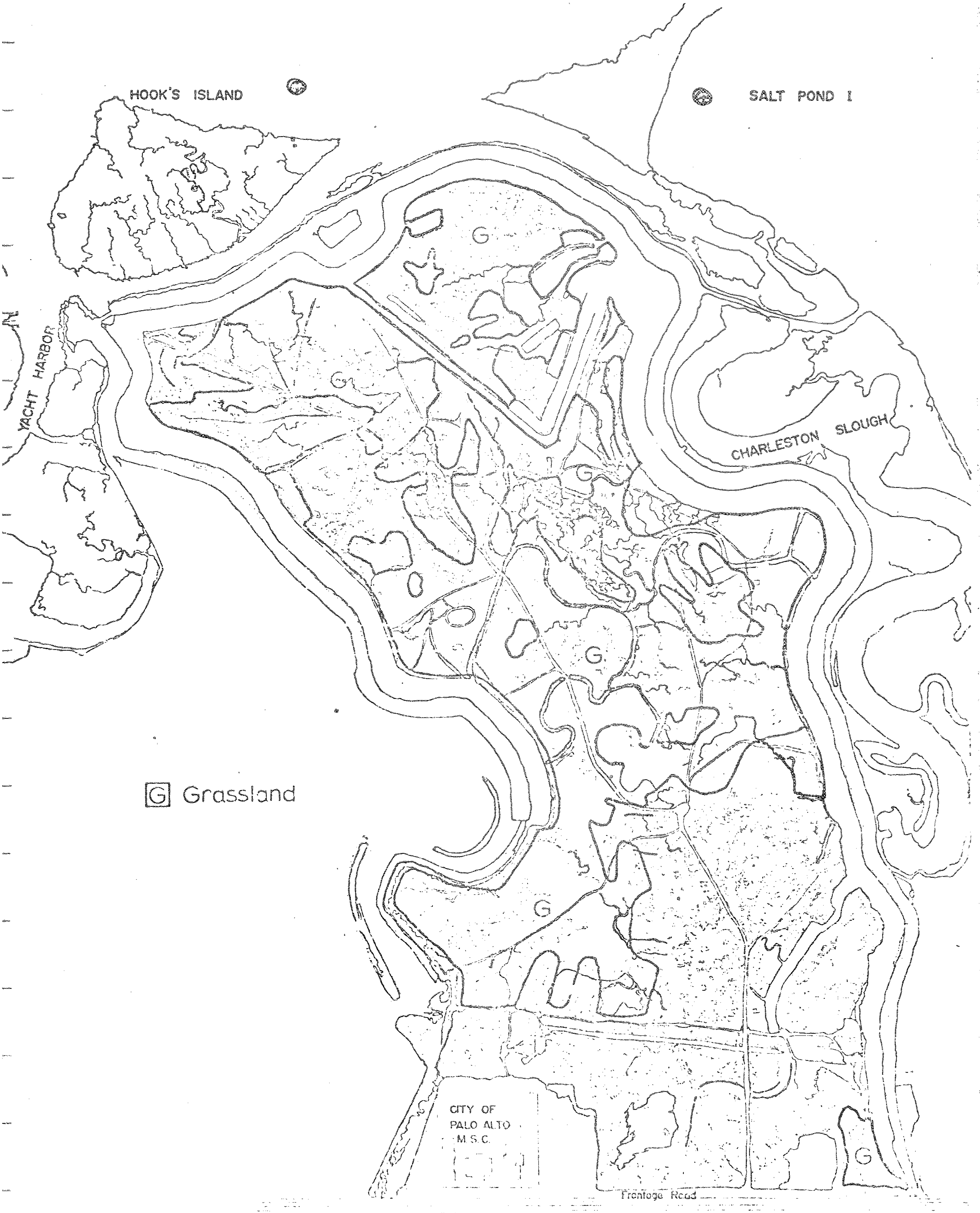
DISSOLVED OXYGEN



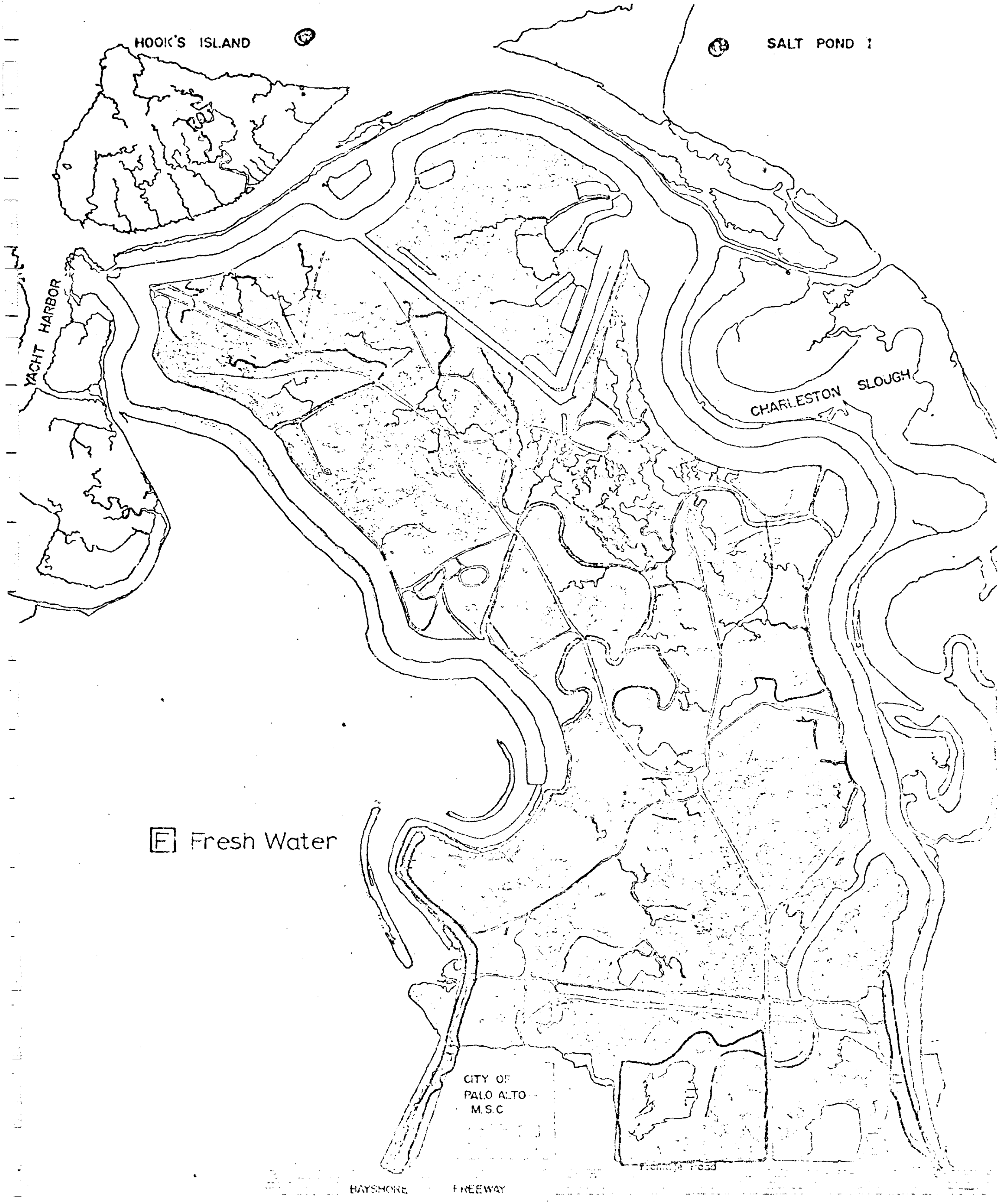
PICKLEWEED VEGETATION



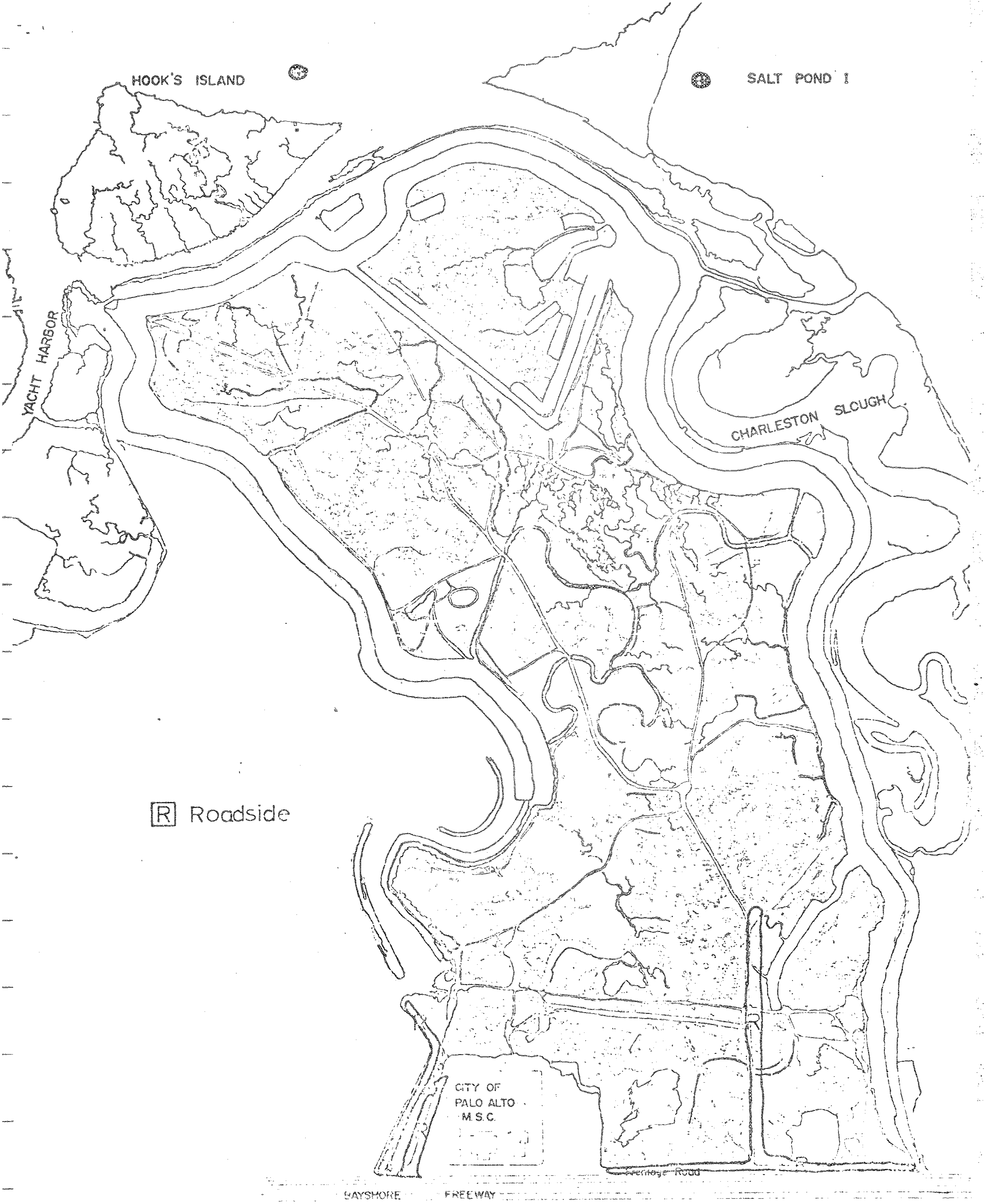
PICKLEWEED VEGETATION IN OLD CHANNELS



GRASSLAND VEGETATION



FRESH WATER VEGETATION



ROADSIDE VEGETATION

APPENDIX C

ACOUSTICAL SURVEY OF PROJECT SITE

by Ralph L. Turner, Jr.

7/14 BRL 7A

RALPH L. TURNER, JR.
ACOUSTICAL & VIBRATIONAL CONSULTANT

1235 Regency Place • San Jose, California 95129 • Telephone (408) 257-3820

February 13, 1975

'75 FEB 14 PM 2:50
SANTA CLARA
VALLEY WATER DISTRICT

Dr. Bernard H. Goldner
Environmental Specialist
Environmental Assessment Division
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

Dear Dr. Goldner:

The improvement to the existing noise environment of the Palo Alto Flood Basin that will occur when the proposed flood wall is constructed has been determined. The descriptions and the discussions of the existing and future noise environments are presented in this report with the general headings to which they should appear in your environmental impact report. Note: Figure numbers and page numbers have been omitted on the drawings so that you may identify them according to your EIR numbering system.

I. DESCRIPTION OF THE PROJECT (ACOUSTICAL ASPECTS)

The Palo Alto Flood Basin is bordered on the west by the heavily trafficked Bayshore Freeway. The erection of the proposed 3 ft. high flood wall adjacent to this freeway will reduce the extent and the levels of the vehicular noise intruding into the flood basin. This will lower the noise exposures of both the people that use the flood basin for recreational pursuits, and the birds and other wildlife that seek refuge there.

II. DESCRIPTION OF THE ENVIRONMENTAL SETTING (ACOUSTICAL ASPECTS)

The existing noise levels in the Palo Alto Flood Basin are primarily caused by the vehicular traffic on the nearby Bayshore Freeway. The L_{50} noise levels, that noise level that exists for 50% of the time, was determined for various distances extending for most of the approximately 1/2 mile depth of the flood basin. These L_{50} noise levels are presented in Table I, and are for the peak hour of traffic of 9600 vehicles per hour as reported by CALTRANS for 1973. The CALTRANS data correlated extremely well with the traffic flow observed during the noise survey.

TABLE I

L_{50} Noise Levels for the Palo Alto Flood Basin for Peak Hour Traffic Flows on Adjacent Bayshore Freeway

Distance From Freeway, ft.	L_{50} Noise Level, dBA
240	69.2
340	67.0
540	64.0
940	60.5
1740	56.5
3340	52.3

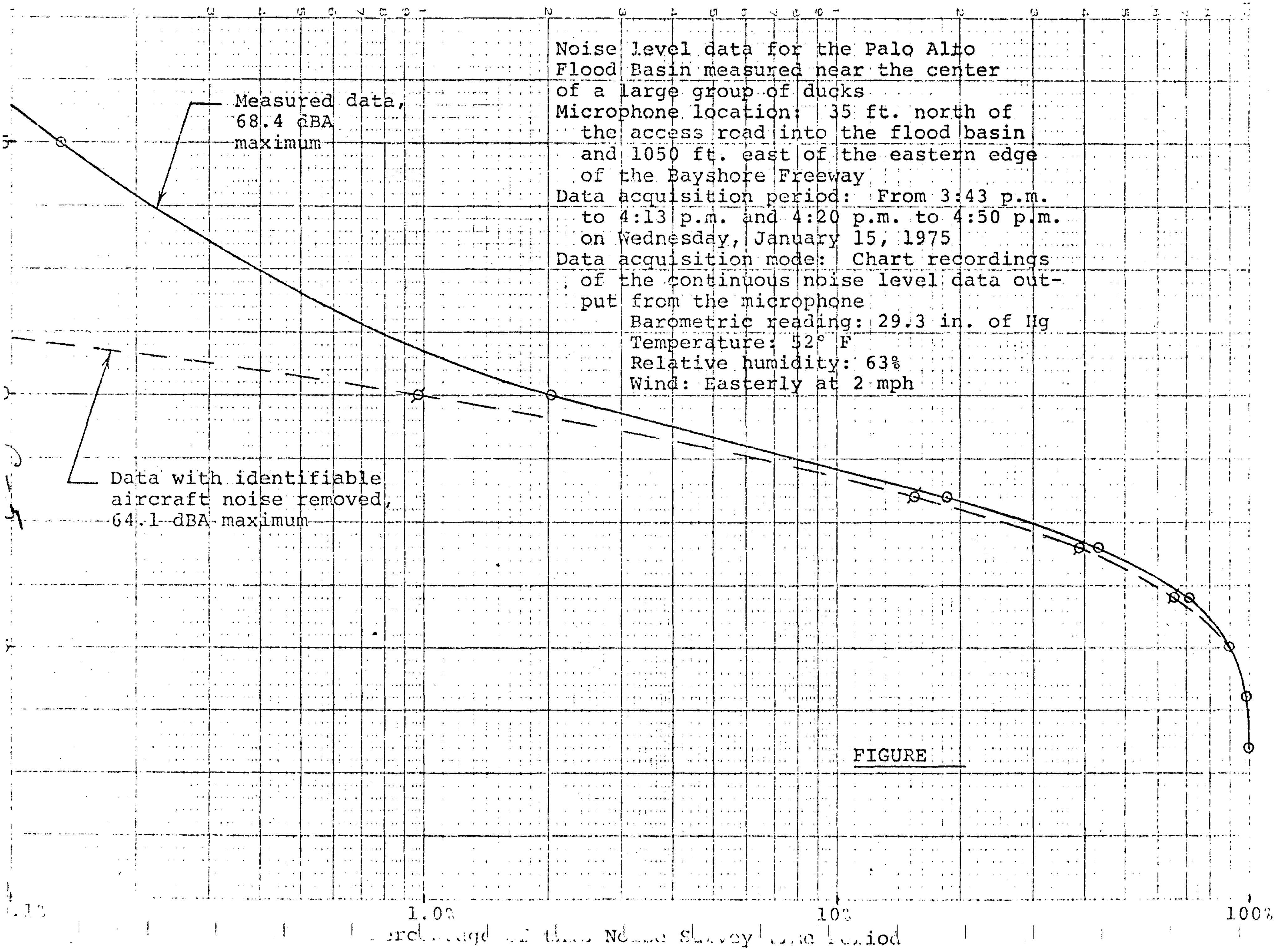
The Table I noise level determinations include the local area noise factors derived from the noise survey data taken at two locations at the flood basin on Wednesday, January 15, 1975. These noise survey data are presented as Figs. ((Copy Editor note: Use your Fig. numbers, also place your numbers after "FIGURE" on each of the two drawings supplied that are marked in pencil "Fig. I" and "Fig. 2" in their margins, respectively.)) Also included in the Table I noise level determinations are the noise levels produced by heavy trucks, which comprised of 3.6% of the freeway traffic. The dBA unit used in Table I is a decibel as measured on the A weighted scale of the sound level meter. The A weighting reduces the importance of the lower frequencies of the noise, approximately as the human ear does, in measuring the noise level. Therefore, the dBA is a useful measure of noise as it effects people.

The effects of the aircraft flying in the area upon the noise levels at the flood basin are shown in ((Fig. 1)). Up to about a 5 dBA increase in noise level for a short period of time was due to these aircraft during the noise survey period.

III. ENVIRONMENTAL IMPACT (ACOUSTICAL ASPECT)

((A.)) The Noise Mitigation Impact

The construction of the proposed three ft. high flood wall between the Palo Alto Flood Basin and the

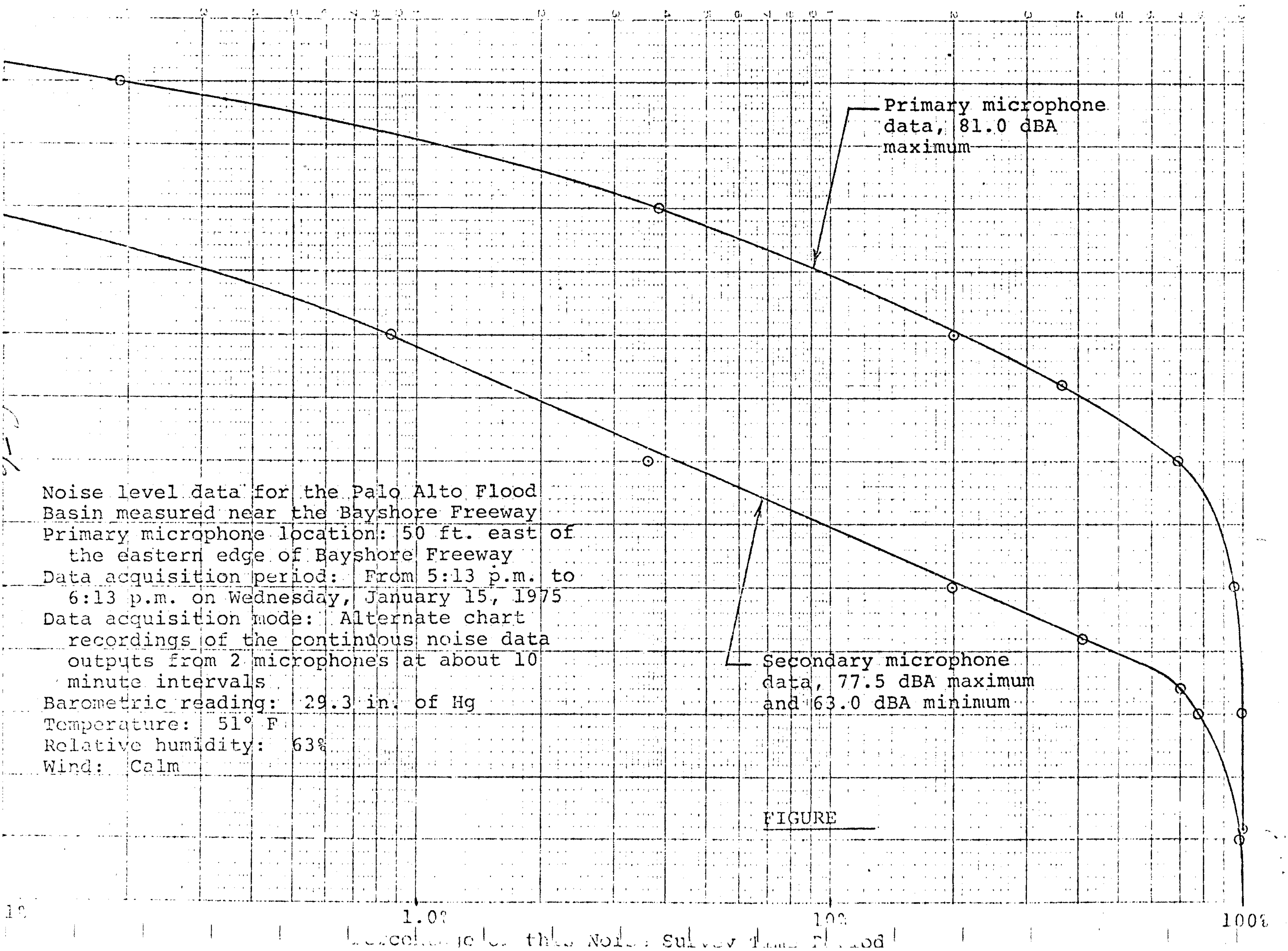


Noise level data for the Palo Alto Flood Basin measured near the center of a large group of ducks
Microphone location: 35 ft. north of the access road into the flood basin and 1050 ft. east of the eastern edge of the Bayshore Freeway
Data acquisition period: From 3:43 p.m. to 4:13 p.m. and 4:20 p.m. to 4:50 p.m. on Wednesday, January 15, 1975
Data acquisition mode: Chart recordings of the continuous noise level data output from the microphone
Barometric reading: 29.3 in. of Hg
Temperature: 52° F
Relative humidity: 63%
Wind: Easterly at 2 mph

Measured data, 68.4 dBA maximum

Data with identifiable aircraft noise removed, 64.1 dBA maximum

FIGURE



Primary microphone data, 81.0 dBA maximum

Secondary microphone data, 77.5 dBA maximum and 63.0 dBA minimum

Noise level data for the Palo Alto Flood Basin measured near the Bayshore Freeway
Primary microphone location: 50 ft. east of the eastern edge of Bayshore Freeway
Data acquisition period: From 5:13 p.m. to 6:13 p.m. on Wednesday, January 15, 1975
Data acquisition mode: Alternate chart recordings of the continuous noise data outputs from 2 microphones at about 10 minute intervals
Barometric reading: 29.3 in. of Hg
Temperature: 51° F
Relative humidity: 63%
Wind: Calm

FIGURE

Bayshore Freeway will appreciably improve the acoustical environment by lessening the noise exposure of the people and the wilding birds and animals that frequent the area.

1. Extent of the Noise Reduction

The proposed 3 ft. high flood wall will be formed of concrete. This air impervious wall construction creates an effective acoustical barrier to the propagation of noise. The estimated noise reductions possible in the noise levels across the flood basin for the peak hour traffic of 9600 vehicles per hour are given in Table II. These estimates include a traffic mix of 3.6% heavy trucks and the remainder of automobiles, small vans, and pickup trucks.

TABLE II

Estimated L_{50} Noise Levels for the Palo Alto Flood Basin With and Without the Proposed Flood Wall for the Peak Hour Traffic on Bayshore Freeway

Northeasterly Distance from Proposed Flood Wall*, ft.	L_{50} Noise Levels, dBA	
	Existing	With Flood Wall
100	69.2	65.4
200	67.0	63.3
400	64.0	60.4
800	60.5	57.0
1600	56.5	53.1
3200	52.3	49.0

*The proposed flood wall will be about 140 ft. northeast of the Bayshore Freeway

Note from Table II that a noticeable 3.3 to 3.8 dBA noise reduction is afforded by the flood wall. In acoustical engineering, a sound level lessening of 3.0 dBA is one in which the energy content of the measured sound pressure levels is halved.

2. Importance of the Noise Reduction

The 3.3 to 3.8 dBA noise reduction that the flood wall will produce is important as it reclaims some flood basin acreage that was too noisy for both man and wilding birds and animals. How much land will be reclaimed is difficult to determine exactly, but an estimate prepared from known facts indicates this reclaimed land to be about 50 acres.

First, an approximate definition of land that is too noisy must be defined. Most people, if given the opportunity, will seek lower levels of noise if the absolute value is too high, just as the chickens mentioned in Ref. 1 ran to the quieter side of their coop when a loud continuous noise was initiated. For humans, the 70 dBA noise level experienced near heavily trafficked highways is actively avoided by most persons when possible. Only until the 55 dBA noise level experienced on residential streets is reached do most people seem to forget about the noise, and choose to stay in the area to do voluntary tasks. Similar behavior in habits of some ducks in the flood basin were observed during the noise survey. The L_{50} noise level was measured at a location which was the same distance away from the center of a large flock of ducks floating on the open water in the flood basin. The noise level measured is presented in ((Fig. 1)) from which the L_{50} noise level is determined to be 56.7 dBA. As there was sufficient open water around them, the ducks could have moved much closer to the Bayshore Freeway and still be surrounded by open water, but they chose not to. A pair of egrets were also observed to fly in from the east, after being scared by shotgun noises further east. They chose to get no closer to the freeway than 1100 ft. This compares to the 1050 ft. distance elected by the ducks.

From the foregoing, it is estimated that an acceptable noise level for humans, birds, and possibly animals from intruding vehicular noise is about 56 dBA. Without the flood wall, this means that an acceptable noise environment now exists at a distance of about 1600 ft. or greater from the Bayshore Freeway during the peak hour of traffic. See Table II. However, if the proposed flood wall is built, the vehicular noise will be partially shielded, and an acceptable noise environment will then start closer to the Bayshore Freeway at a distance of 800 ft. Again see Table II. The 800 ft. to 1600 ft. from the freeway band across the approximately 1/2 mile width of the flood basin will result in the return to an acceptable noise environment of about 50 acres.

The above assessment was for the worst noise exposures that occur during the peak hour of traffic on the freeway. The above reclaimed areas refer to areas that will always have an acceptable noise environment. These areas would be suitable for persons desiring to walk their dog or train him at any time of the day or night, and for encouraging the over 40 species of birds in the flood basin to build nests during the appropriate season.

There are areas that will have noise environments of acceptability that will vary inversely as the freeway traffic volume. Land in a band 400 ft. to 1600 ft. northeast of the proposed flood wall line now have an acceptable noise environment for about 50% of the time. This band of land will shrink and move closer to the freeway, to 200 ft. to 800 ft. northeast of the flood wall once it has been constructed. The band shrinkage is due to the increase in land with an always acceptable noise environment.

IV. ANY ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSAL IS IMPLEMENTED (ACOUSTICAL ASPECT):

The effects of constructing the flood wall are very favorable to the noise environment at the flood basin. An estimated 50 acres of land will be returned to an always acceptable noise environment.

V. MITIGATION MEASURES PROPOSED TO MINIMIZE THE IMPACT (ACOUSTICAL ASPECT)

No acoustical mitigation measures are required. The proposed construction of the flood wall between the Palo Alto Flood Basin and the Bayshore Freeway is a desirable noise mitigation measure of itself that will reduce the noise levels at the flood basin by 3.3 to 3.8 dBA.

VI. ALTERNATIVE TO THE PROPOSED ACTION (ACOUSTICAL ASPECT)

Any alternative to the proposed construction of the flood wall between the Palo Alto Flood Basin and the Bayshore Freeway will deprive the flood basin of a desirable noise barrier. The proposed flood wall will reduce the noise levels in the flood basin by an estimated 3.3 to 3.8 dBA.

VII. THE RELATIONSHIP BETWEEN LOCAL SHORT TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY (ACOUSTICAL ASPECT)

The construction of the proposed flood wall will preserve and increase the long-term ability of the Palo Alto Flood Basin to serve as a recreational area and a sanctuary for wilding birds and animals. An estimated 50 acres of land will be returned to an always acceptable noise environment by the noise barrier characteristics of the flood wall.

VIII. ANY IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED (ACOUSTICAL ASPECT)

The constructing of the flood wall between the Palo Alto Flood Basin and the Bayshore Freeway will result in a better noise environment. The flood wall will act as an acoustical barrier reducing the noise levels at the flood basin by an estimated 3.3 to 3.8 dBA. This better noise environment will endure for the life of the flood wall.

IX. THE GROWTH-INDUCING IMPACT OF THE PROPOSED ACTION (ACOUSTICAL ASPECTS)

(No significant acoustical implications)

X. ORGANIZATIONS AND PERSONS CONSULTED

None

XI. REFERENCES

1. Effects of Noise on Wildlife and Other Animals, Report No. NTID 300.5, U.S. Environmental

Protection Agency, Washington, D.C.

2. Highway Noise, a Design Guide for Highway Engineers, National Cooperative Highway Research Program Report 117, Highway Research Board, 1971

XII. APPENDIX

Noise Level References

The noise level references given below are for the approximate average noise level at a distance of about 25 ft.

Very loud	- Motorcycle, heavy truck	90 dBA
Loud	- Busy street	70 dBA
Moderate	- Residential street	55 dBA
Quiet	- Private office	40 dBA
Faint	- Wind through leaves	20 dBA

XIII. FINAL STATEMENT

The above report is a summary of the original analysis performed of the acoustical environment, existing and future, of the proposed flood control improvement to the Palo Alto Flood Basin, in Palo Alto, California. This report has been written to facilitate its inclusion into your EIR for the same project as best as possible.

Please call if you have any questions.

Respectfully submitted,

Ralph L. Turner Jr.

Ralph L. Turner, Jr.
Registered Professional Engineer
#12,526
Mechanical
State of California

APPENDIX D

RESPONSES TO PUBLIC COMMENTS AND QUESTIONS ON THE ENGINEER'S REPORT AND DRAFT ENVIRONMENTAL IMPACT REPORT

City of Palo Alto Comments

The City of Palo Alto Staff Report to the City Council, dated July 15, 1976, for the Council's July 19, 1976 meeting, made the following recommendations.

"Recommendations

> It is recommended that the Council transmit to the Water District for inclusion in the final Engineer's Report and EIR, along with appropriate responses, this staff report including the attached May 13th report; the Planning Commission's June 23rd minutes; and whatever additional comments members of the public and Council may make at the July 19th Council meeting.
>
> It is also recommended that the Council make a finding that the proposed project is consistent with Palo Alto's adopted Open Space Plan (April, 1973) which notes on page 21, (Baylands Action Program Number 3) that the City "has determined that flood control will be the primary purpose of the Flood Basin, and that preservation of wetland and wildlife habitat will be the secondary purpose." Consistency with the Open Space Plan was discussed by the Planning Commission on June 23rd and a statement acknowledging the consistency is included in the Commission's minutes."

The following is a discussion of how the above comments by the City Council will be addressed in the final EIR.

The City Council adopted the Staff's recommendations on July 19, 1976. The writers of this Engineer's Report (ER) and Environmental Impact Report (EIR) intend to answer all questions, discuss all significant comments and make all revisions in the final ER and EIR that are appropriate.

In view of the action taken by the City Council on July 19, 1976, the following documents will be reproduced unabridged in this portion of the final EIR.

- May 13, 1976 Staff Report to City Council, including Staff's comments on the ER and Draft EIR.
- July 23, 1976 Letter from City Manager, George A. Sipel

The complete minutes of the Planning Commission's June 23rd meeting are far too cumbersome to reproduce in this EIR. However, the major comments of the Commission were summarized by Mr. Ken Schreiber at the Water District's Public Hearing on July 21, 1976. Mr. Schreiber's comments will be reproduced in this EIR.

staff report

May 13, 1976

HONORABLE CITY COUNCIL
Palo Alto, California

Proposed Raising of Levees at the Palo Alto Flood Basin - Draft Environmental Impact Report

Members of the Council:

Discussions on this project which began with a Citizens' Study Committee in January of 1974, were suspended in August 1974 pending completion of an Environmental Impact Report. The Draft EIR has been completed and is attached. It is preceded by an Engineer's Report which describes the project in detail. A Public Hearing on the Draft EIR will be held by the Santa Clara Valley Water District Board of Directors on July 21, 1976, at the Baylands Interpretative Center. Pursuant to the California Environmental Quality Act and the state guidelines, the Water District has requested review of and comment on the Draft EIR by the City prior to that date.

Staff members of the Nature and Science, Public Works and Planning Department have reviewed the Engineer's Report and EIR and their comments are attached.

This Report recommends that the Engineer's Report and EIR be sent to the Planning Commission for its review, comments, and recommendations for consideration by the City Council. It is suggested that the City Council then consider these recommendations, formulate its own recommendations, and refer final recommendations, to staff for transmittal to the SCVWD for consideration at the July 21 meeting.

Discussion

During 1974 a series of four meetings were held with a Citizens' Study Committee (roster attached - Appendix A) to discuss concerns about raising of the levees. As a result of these meetings and Planning Commission discussion, there was agreement on the basic direction that the design of the levees should take. This agreement is reflected in the attached two schematic drawings identified as Alternative 3 (Appendix B) which show the proposed method of construction employing the use of earth levees and flood walls. The plans attached to the Engineer's Report are in accordance with Alternative 3.

Also attached is a Chronology of Events - Palo Alto Flood Basin (Appendix C) which outlines the specific concerns and design concepts that were considered, as well as the general direction given to the Santa Clara Valley Water District.

CMR:211:6

As a result of these discussions, the Santa Clara Valley Water District agreed to prepare an Environmental Impact Report. At that time it was also agreed the Draft EIR would be submitted to the Planning Commission for review and recommendation to the City Council. Copies of the EIR would also be mailed to all members of the Study Committee.

Subsequently, the Santa Clara Valley Water District made an application to the Department of the Army for a permit to raise the existing levees and construct concrete flood walls on portions of the Flood Basin in accordance with prior discussion with the Planning Commission and Study Committee. In response to the Public Notice (No. 75-336-81) the City Council requested the Army to delay any action pending completion of the EIR. The entire Public Notice is attached for information purposes (Appendix D) since it contains information about how the levees are proposed to be raised in the Flood Basin.

It should be noted that the proposed improvements will complete the levee system around the Flood Basin as part of flood protection facilities for the so-called 100-year flood. Construction of these improvements is financed by a tax levied on the Northwest Zone of the County, which includes the Cities of Palo Alto, Mountain View, Sunnyvale, Cupertino, Los Altos, and Los Altos Hills.

The Water District staff will make a presentation to the Planning Commission. Members of the Citizens' Study Committee will also be invited to this meeting in order to provide their input. The Planning Commission will then be in a position to make its recommendations to the City Council for consideration and subsequent submittal of the Council recommendations to the Santa Clara Valley Water District Board of Directors for the July 21 Public Hearing.

Although there has been a commitment made by the Water District to have the plans reviewed by the Study Committee, the Planning Commission, and the Architectural Review Board, it is appropriate that this review process not take place until the Environmental Impact Report has been determined to be sufficient. On the basis of the approval of the EIR, plans could then be reviewed and approved by these various groups. Review and approval by the Planning Commission and the Architectural Review Board would also be done to meet the Site and Design requirements of the Zoning Ordinance.

Recommendations

It is recommended that the City Council refer the Engineer's Report and Draft

EIR to the Planning Commission for review and comments to the City Council.

Respectfully submitted,

Kenneth R. Schreiber

KENNETH R. SCHREIBER
Assistant Director of Planning

Naphtali H. Knox /g

NAPHTALI H. KNOX
Director of Planning and
Community Environment

Attachments

cc: Planning Commission
Palo Alto Flood Basin Study Committee
Edwin Ferguson, Santa Clara Valley Water District

CMR:211:6

STAFF COMMENTS ON ENGINEER'S REPORT AND DRAFT EIR FOR PALO ALTO FLOOD BASIN LEVEE PROJECT

The Engineer's Report and Draft Environmental Impact Report have been reviewed by City staff in the Planning, Public Works, and Nature and Science Departments. Following is a composite of all reviewers' comments. It is suggested that they serve as a basis for review by the Planning Commission, Citizens' Flood Basin Study Committee and City Council.

COMMENTS ON ENGINEER'S REPORT

Major points:

1. The Flood Basin Mitigation project should be described briefly in the Introduction. This is an important project and is only mentioned by reference on page 4.

2. An explanation should be made of how the +7.0 feet above mean sea level was chosen as the design elevation for the flood wall. This figure is mentioned on page 20 and in subsequent places in the Engineering Report and the EIR. The relationship of mean sea level to mean higher high water (used by the Corps of Engineers), and between the +9.0 elevation of the Bayward levees and the proposed +7.0 elevation should be mentioned.

3. There are two sources of flooding in the area between Adobe and Matadero Creeks and Bayshore Freeway and Louis Road, the area encompassed by Figure 4 in the Engineers Report. The two sources will become evident by comparing Figure 4 with the current Palo Alto Flood Hazard Map and considering the design parameters involved. One source of flooding is from backing-up of flood basin waters into the area shown by Figure 4, and would be corrected by the proposed control measures contained in the Engineering Report. The other source of flooding is from overtopping by flood waters due to channel restrictions in Adobe, Barron, and Matadero Creeks, at their streets under crossings between El Camino Real and Bayshore Freeway. This latter source will not be corrected by the proposed project. Accordingly, the Engineer's Report should be corrected as follows:

   a) Add the following to the end of the third sentence of the third paragraph of the Manager's transmittal letter to the SCVWD Board: "except for localized flooding due to channel restrictions at the street crossings of Adobe, Barron, and Matadero Creeks."

   b) Similarly, the text on page 4, paragraph 1, and page 12 should be changed to include this second source of flooding.

c) Additional maps should be included showing the before and after flooding conditions once the proposed project has been built.

It is anticipated that the SCVWD will clarify items a), b), and c) prior to consideration of the draft EIR by the Planning Commission.

4. Further clarification on the proposed landscaping is needed. In paragraph 3 of the transmittal letter it is not clear whether all the levees will be landscaped or only the new ones as part of this project. It is not clear who will plant and maintain the landscaping. It should be clearly stated on page 28 that the plants will be chosen from the approved Baylands Master Plan list rather than "be guided by" their list.

Minor points

5. On page 3, paragraph 2, add that after the fourth phase a permit must be obtained from the Corps of Engineers.

6. On page 7, the last sentence should be amended to read "The lower reaches of these creeks were channelized in concrete..."

7. The figures in Table 2, page 20 do not add up. Shouldn't the totals for the three creeks read 5550 cubic feet per second, and 6900 acre feet?

Comments on the draft EIR

Major points:

8. An explanation of the design elevation should be included on page 1, referring to comment number 2, above.

9. The Flood Basin Mitigation project needs to be described in detail on page 24, referring to comment number 1, above. The Flood Basin Mitigation would not return the entire Flood Basin to salt marsh, as implied on page 35. The only salt marsh plant rehabilitation that will take place will be in the existing marsh channel. This section should be reworded.

10. The first sentence on page 25, paragraph 2 should be reworded to read "The Flood Basin is dedicated parkland and has been designated a wetland preserve, as recommended in the Open Space Plan of the City of Palo Alto."

11. Motorcycle riding is prohibited in the Palo Alto Flood Basin as well as in the rest of Palo Alto's marshlands. This reference on page 31, paragraph 5 should be deleted. Bicycling should be added

to the list of recreational activities in the Baylands. Access to the Flood Basin would be carefully controlled after completion of this project. This should be stated in paragraph 2, page 31.

12. The threat of flooding by a 1% flood would not be totally eliminated as a result of this project as stated on page 51, paragraph 1, and page 52, paragraph 2. See discussion in comment number 3.

Minor comments

13. Treatment of the flood wall, described on page 27, should be subject to the Architectural Review Board's recommendations. A suggested treatment might be a brownish-buff colored-exposed aggregate.

14. The terms "fat clay" on page 6, paragraph 3 and "ruderal weeds" on page 47 and 48 need definition.

15. Data from the U.S. Geological Survey and California Division of Mines and Geology indicate the probability for liquefaction in the Baylands is generally moderate, not low, as stated on page 8, paragraph 2. (See Seismic Safety/Safety Background Report, Palo Alto Comprehensive Plan, December, 1975).

16. Copies of the letters from the Corps of Engineers and the Water Quality Control Board referred to on page 27 should be included in the Appendix.

17. The sentence at the top of page 29 should be rewritten to read: "The City's current population is estimated to be about 56,000. This figure includes the population of recently-annexed Barron Park."

18. School Districts, page 30, should include Palo Alto Unified School District and Foothill College District. Stanford University is a private institution, not a district.

19. On page 30, under Transportation, the figure of "6100 vehicles per day near San Antonio Road" should be changed to "5100 vehicles...". We suggest substituting the official map of 1974 traffic counts in Palo Alto for your Figure 8 which is out-of-date. Copy attached.

20. It should be stated, on page 59, who will build and maintain the pedestrian and bicycle access through the wall to the Flood Basin.

21. The advisory committee should be called the "Citizen's Flood Basin Study Committee" on page 62, paragraph 2, and page 68, last line.

22. A possible increase in housing density in Palo Alto does not hinge on the Flood Basin levee project. This phase should be omitted, on page 67.

Responses to May 13, 1975
Staff Report to City Council

The first three pages to this report appear to be ministerial in nature and do not call for responses. The essence of this staff report is the staff's comments that start on page 6.

Comments on Engineer's Report

Major Points

1. The flood basin mitigation project was not described in the Engineer's Report (ER) because that project is not germane to the flood basin levee project. The levee project will not adversely affect any present or planned use of the flood basin. In fact, the levee project will help control vehicular access to the flood basin, as stated on page 21 of the ER.

2. The answer to the question about how the +7.0 feet above mean sea level was chosen as the design elevation for the floodwalls is in the ER on pages 4 and 21. Page 4 refers to the Water District report "Storage Capability of the Palo Alto Flood Basin, March 1974". This report determined that the levees should be built to elevation +7.0. Page 21 lists the major parameters considered in calculating the height of the floodwalls. Among these parameters were: Inflow into the Flood Basin, storage volume, basin pool elevation, discharge through the tide gates and the tide cycle. The tide cycle used in this study was an average of certain 4-day winter tides recorded and adjusted for the years 1967 through 1972. The highest elevation of the adjusted tide was +6.7 feet. One of the comments on this ER and draft EIR from the Corps of Engineers was that they now believe that their so called "100-year" tide is +7.5 feet above mean sea level. We believe that the occurrence of a 1% inflow into

the basin and a tide of +7.5 happening at the same time is very remote. However, tides between 6 and 7 feet happen often enough where a tide of +6.7 feet could easily occur when a 1% inflow hits the Flood Basin. Relationships between parameters and the most critical combination of the time to peak and the tide cycle were established with the help of a computer program. It was found that the maximum storage elevation in the Flood Basin for the 1% inflow would be +4.6 feet. Note that the lowest point on Bayshore Freeway is about +3.2 feet above mean sea level. A freeboard of 2.4 feet was added to the storage elevation to account for wave action, levee consolidation and possible future ground subsidence. Since there appears to be some confusion about this study, the entire March 1974 storage capability report is appended to this ER and final EIR.

3. This comment applies to the April 1976 ER and draft EIR (with the blue cover) that was circulated for public review. The writers of this ER and EIR agree with comment 3. As a result of this comment, the Water District amended the ER and draft EIR on June 8, 1976 (the yellow covered report) and sent copies to all persons holding the blue covered copy. The essence of the changes appear in the amended (yellow cover) report.

4. This comment concerns further clarification on the proposed landscaping. The Water District proposes to landscape only those levees connected with the levee raising project and not all of the levees around the flood basin. The purpose of the proposed landscaping is to mitigate the effects of the proposed project and to leave the site in even better condition than before the project is built. The question of landscaping

or seeding all of the other levees around the flood basin will be considered in light of priorities for landscaping the many other miles of levees, channels, creeks and percolation ponds already existing within the District. At this time (summer 1976) the District does not have any plans to landscape the remaining untouched levees around the flood basin.

The landscaping at the levee raising site will be done by separate contract immediately following the completion of the levee raising project. This work will be done by the Water District. At this time the Water District plans to maintain the landscaping within its right of way and the City of Palo Alto maintain the landscaping in its right of way. The type of vegetation to be selected will not need much maintenance once established. The District staff plans to meet with the City staff to discuss a possible agreement for one agency or the other to do the maintenance. The details of such an agreement have not yet been worked out; however, the reader of this report may be assured that all details will be worked out to the satisfaction of both agencies before the landscaping is planted.

On the question of what "list" will be used to select plants, again one may be assured that the best plants for the site will be selected and to the satisfaction of both agencies.

Minor Points

1. The fact that a permit is required from the Corps of Engineers for the fourth stage project does not seem to be pertinent to the ER. However, since the comment was made - yes, a permit is required for the fourth stage. The fourth stage is the project proposed herein.

2. On page 7 of the ER add to the last sentence, "the lower reaches of these creeks were channelized in concrete."

3. The figures in Table 2, page 20, are not supposed to add up. The reason for this is that the peak flow from one creek hits the Flood Basin before the peak from the other creeks hit the basin. The combined Adobe-Barron Creek watershed is much longer than the Matadero Creek watershed. It takes longer for the water to flow from the foothills down Adobe Creek to the basin than down Matadero Creek. By the time that the peak flow from Adobe and Barron Creeks combine to enter the basin, the peak flow in Matadero Creek has already passed and the flow rate in Matadero Creek is starting to recede. Therefore, one would expect the peak flow into the basin to be something slightly less than the sum of the peak flows at the two entry points into the basin, which of course is the case here.

Comments on the Draft EIR

Major Points

8. An explanation of the design elevations is more appropriately made in the ER. As explained on page D-9 of these comments, a copy of the Water District's report "Storage Capability of the Palo Alto Flood Basin, March 1974" is now appended to this final EIR. This report tells why the elevation +7.0 above mean sea level was selected for the height of the levees or walls.

9. This comment refers to the lack of detail in the EIR about the City's Flood Basin Mitigation project and that page 35 of the EIR incorrectly implies that the Flood Basin Mitigation project would return the entire basin to marsh lands.

The discussion on page 35 was not intended to imply that the entire basin would return to a salt marsh if the City's mitigation project is built. See pages 32 and 34 for changes in wording which should correct this impression.

10, 11, 12. Please see pages 25, 31, 51, and 52 of the final EIR for the revised wording that was generated from these comments.

Minor Comments

13. The detailed treatment of the floodwall will be worked out between the Water District's Landscape Architect, the Project Engineer and the City of Palo Alto's engineering staff. This design, along with the landscaping design will be reviewed by the City's Architectural Review Board and by any and all appropriate departments in the City before the Water District will allow the construction to begin. Consequently, the details of the design were not available for the draft or for the final EIR. The treatment of the wall will reflect the comments received from the Citizen's Flood Basin Study Committee, the Planning Commission and the City staff. When the detailed wall design and the construction plans and specifications are complete they will be sent to the City staff for a careful review and issuance of all necessary permits.

Comments 14 through 22, except comment 20. See the appropriate page in the final EIR for revised wording.

20. The Water District will build the pedestrian and bicycle access into the Flood Basin. The City will install any gates or other control devices that they deem appropriate.

City of Palo Alto

California
94301

July 23, 1976

Santa Clara Valley Water District Board of Directors
Mr. James J. Lenihan, Chairman
5750 Almaden Expressway
San Jose, CA 95118

Dear Mr. Lenihan:

On July 19, 1976, during the Palo Alto City Council's review of the Valley Water District's proposed Palo Alto Flood Basin levee raising project, concern was expressed about the continued threat of flooding from Adobe, Barron, and Matadero Creeks. The cause of this problem, as noted in the Engineer's Report prepared by the District for the levee project, is that culverts located between Louis Road and Alma Street are too small to carry the flood flows of the creeks.

The City Council, by a unanimous vote, expressed Palo Alto's desire to have a rapid solution to the problem of restricted capacity in the culverts of Adobe, Barron, and Matadero Creeks upstream from the Flood Basin.

We understand that the Water District's staff is studying this problem. The prompt completion of this study and implementation of a solution will be greatly appreciated.

Thank you for your attention to this matter.

Sincerely,

GEORGE A. SIPEL
City Manager

cc: City Council
Planning Commission
Director of Public Works

August 5, 1976

Mr. George A. Sipel
City Manager
City of Palo Alto
250 Hamilton Avenue
Palo Alto, California 94301

Dear Mr. Sipel:

Thank you for your letter dated July 23, 1976 encouraging us to take steps to resolve the flooding problem in Palo Alto caused by undersized culverts on Adobe, Barron and Matadero Creeks between Louis Road and El Camino Real. We have in our present budget a project to do the planning study for this reach of these creeks.

Our plan of study includes analysis of the problem in detail, exploring alternative solutions, make an environmental assessment of the project and then prepare a report stating a proposed course of action. This will require public involvement including coordination with your staff. Our schedule calls for this work to be complete in this fiscal year (1976-77).

Following the adoption of a plan and the determination that funds are available for construction we will do the final design and the construction. The allocation of funds is based on relative project priorities with the Northwest Flood Control Zone and is reviewed by the zone advisory committee. Our staff feels this project will receive a top priority.

In summary, we recognize the flood problems you described in your letter and we are taking steps to resolve it.

Sincerely yours,

ORIGINAL SIGNED BY

James J. Lenihan
Chairman, Board of Directors

cc: All Directors, SCVWD
E. Ferguson
J. Richardson

Comments by Mr. Ken Schreiber at the Public Hearing on July 21, 1976

My name is Kenneth Schreiber and I'm Assistant Planning Director for the City of Palo Alto, 250 Hamilton Avenue, Palo Alto. A letter was placed before each Board Member tonight from the City Manager which transmits the City Council action of July 19th when they discussed the Engineer's Report and Draft Environmental Impact Report. The letter also transmits the staff report of the June 23, 1976 Palo Alto Planning Commission meeting. The Council Minutes will be forwarded as soon as they are available, but the letter does summarize the major comments made by the members of the Council. Along with comments on the EIR and the Engineer's Report the Council also found the proposed project consistent with Palo Alto's open space element. The letter mentions the Planning Commission's comments and indicates they are summarized on pages 462 and 463 of the Commission's minutes. For the sake of the record I'd like to take a minute or two and briefly note the major comments of the Commission which are elaborated on at greater length in the minutes. The first comment was a comment regarding the need to further investigate the possibility of noise reflection off of the walls that could create problems for residents on the west side of the freeway. It's acknowledged certainly that the wall will create noise protection for the flood basin area. One of the commissioners questioned whether the EIR should more accurately discuss potential seismic danger within the area. The Commissioner also indicates that more explanation of the assumptions used in preparing the hydrograph would be helpful. Two commissioners requested an explanation of the

Water District's easements and also an indication of any payment relationship between the City and Water District for use of the flood basin levees. Several commissioners indicated the need in the EIR for more discussion of upstream improvements needed to complete protection of the area west of Bayshore. I might add that the City Council did pick up on the point considerably. At the meeting Monday night they directed staff to transmit their feelings to the Board that they would hope that action on improving the upstream reaches on Matadero, Adobe, and Barron Creeks could go forward as expeditiously as possible. Members of the Commission also questioned the amount of freeboard designed in this project and related this to the desire to lower the top of the wall in order to maintain some of the existing views from Bayshore Frontage Road and from the Bayshore Freeway. One Commissioner commented that controlling access to the flood basin as proposed in this project, is a positive mitigation measure. These comments should be accompanied by alternatives available to the City that do not involve levees and walls. Commissioners noted that the project is consistent with the adopted open space element and noted that the primary use of the flood basin is internal and that fact should be taken into consideration in discussing visual amenities. Other Commissioners also noted that they think the project should go forward with greater consideration given to providing a distinct visual separation between the roadway and the flood basin, coupling with the idea that the use of the flood basin is basically internal. I think there you can see a split on the Commission regarding the attitude toward visual amenities of the flood basin, with some Commissioners favoring protecting the visual amenities from the outside looking in and others more inclined to say that the flood basin will be a more suitable area if it is more highly protected and, the wall would do that.

Those are the major comments of the Commission. These comments are covered in greater depth in the minutes. Mr. Ben Pawloski, Director of Public Works and I will be here for the meeting tonight and will be glad to answer any questions you might have.

Responses to Comments by Mr. Schreiber

Mr. Schreiber's comments to the Water District Board of Directors on July 21, 1976 transmitted the Planning Commission's comments.

The question about noise reflection off the walls was answered By Dr. Bernard Goldner at the Public Hearing. Although noise reflection was not discussed in the draft EIR, Dr. Goldner discussed the question with Mr. Ralph L. Turner, Jr., Acoustical Consultant to the District, during the period that the project was being planned. Dr. Goldner was informed that the wall is so low and the distance so far from the residential area that it would not reflect any significant freeway noise that could adversely affect the residences southwesterly of the freeway.

It is the opinion of the writers of the draft EIR that the potential for seismic danger within the area was adequately discussed on page 39 of the draft EIR. The potential seismic loading on the new levees and wall will be considered in the detailed structural design.

The comments about explaining the assumptions used in preparing the hydrograph and the freeboard and about lowering the height of the floodwall to maintain some of the view has now been answered by appending to this final EIR the report "Storage Capability of the Palo Alto Flood Basin, March 1974". It should be clear from this report that many alternatives were looked at, that all the parameters available in the art and science of hydrology were used to arrive at the correct wall height and that any reduction in the freeboard would not provide adequate protection to the people who live southwesterly of Bayshore Freeway.

The City of Palo Alto granted an easement to the Water District around the perimeter of the flood basin for the purpose of building levees. There was no cost to the District for this easement. The District then constructed, at District expense, the levees, except for the levees that are the subject of this project.

In regard to the comments about a need in the EIR for more discussion of upstream improvements on Adobe, Barron and Matadero Creeks to complete the protection to the area west of Bayshore Freeway, this discussion is now a part of this final EIR on page D-15 which is the August 5, 1976 letter to Mr. George A. Sipel, City Manager of Palo Alto from Mr. James J. Lenihan, Chairman of the Water District Board of Directors.

Regarding the comment about alternatives that do not involve levees and walls, many alternatives were considered during the study that resulted in the attached report, "Storage Capability of the Palo Alto Flood Basin, March 1974". Among these alternatives was a bypass pipe around the Flood Basin, raised levees on the three tributary creeks, more flood gates, and an expansion of the area of the basin. These alternatives were not discussed in the March 1974 report because they were all found to be less feasible then the alternative of raising the levees. The choices then, are the alternative ways to complete the Flood Basin project. These alternatives were reviewed, discussed, and studied by The Citizen's Flood Basin Study Committee established by the City of Palo Alto. This committee recommended the levee and wall alternative which is now the recommended project and the one upon which the EIR was written.

Letters from the Public

The following letter from Mr. Lesh was sent to the persons on the distribution list at the end of the letter. Since it was sent to the Palo Alto Times and was published in the "Letters to the Editor" column, Mr. O'Halloran's reply to Mr. Lesh's letter was also sent to the Times. The reply was subsequently published in the "Letters to the Editor" column. Mr. Lesh's letter and Mr. O'Halloran's reply follow:

E. D. Lesh
2845 Waverley Street
Palo Alto, CA 94306

Dear Sir:

After an extensive study of the Environmental Impact Report on the flood control measures of the Palo Alto flood basin, I have reached some conclusions that I would like to pass on to you. I spent five years (1937 through 1941) working in the area in question.

The Santa Clara Valley Water Control District proposes to build a levee with a wall on top of the levee at a cost of $500,000 to the taxpayers of the northern section of Santa Clara County (property owners of Palo Alto). They cite three floods that occured near the bay in 1940, 1955 and 1958. None of these floods reached the Bayshore Highway in the area where they propose to build the levee and wall.

In 1940, the flood basin was open to the tides. Adobe Creek was a shallow ditch along Charleston Road for about three-hundred yards. Then it turned and entered the basin at the same place where it now enters. It had very low levees along Charleston Road, and none farther out. Since then the creek has been moved north, and the channel has been deepened and cemented, with levees all the way back to Middlefield Road. Also, the area west of Bayshore Highway has been filled for about three or four feet.

Barron Creek at that time emptied into the baylands west of Bayshore Highway, then drained into Adobe Creek and entered the basin. It also has been deepened and levees have been built up back to Middlefield Road. This creek rises and falls very fast.

Matadero Creek is the largest of the three creeks that empty into the flood basin. In 1940, Matadero Creek was not as deep as it is now, especially out near the flood basin. Its channel was deepened and cemented after 1946. I have watched the creek often at Waverley Street when we have had hard rains; it has not been much over half full since that time.

The floods of 1955 and 1958 were caused by the San Francisquito Creek overflow. In 1955 the flood was caused mostly by debris accumulating under the bridge at Bayshore Highway. Also, before 1955 San Francisquito Creek emptied into the Faber tract and the tidewater did not enter the creek. In 1955 the creek was opened to the tide. There were no levees west of Bayshore Highway, trees and brush were growing in the creek, and debris was thrown into the creek upstream. Since then the creek has been leveed and cleaned out. In 1958 the flood was caused by a levee break near the Palo Alto golf course. This break was open for a number of days. The water from the break flooded the area south of Embarcadero Road. Since then the levee along the golf course has been built up and made stronger. Anything done at the flood basin will not affect the San Francisquito Creek flooding.

On page 21 of the Amended Environmental Report is a chart stating the the most water that could flow into the flood basin for a 48-hour period under the 100-year recurrence frequency would be 6575-acre feet. Under these figures, the water would have 48 hours to drain off. It can be said that at high tide the water will not drain. The tide comes in for about six hours. It is at its height for only about 15 minutes, then it goes out. The water will run out as soon as the water is lower than the water inside the flood basin. The flood basin could hold at least 3,500-acre feet at any time. There would be a runoff of more than this amount each 24 hours through the tidegates (spillway) depending on how much water was in the tide basin. If the Santa Clara Valley

Water Control District is concerned that the flood basin would not be able to get rid of the water in time, a spillway could be constructed next to the city dump at the Mayfield slough to help drain off the water and also to flush out the channel for the yacht harbor.

I hope the officials will reconsider this project. It could save the taxpayers $500,000.

Sincerely,

Edward D. Lesh

Edward D. Lesh

2845 Waverley Street

Palo Alto, CA 94306

TO: Mr. John L. O'Halloran
General Manager
Santa Clara Valley Water District
5750 Alamden Expressway
San Jose, CA 95118

Mayor Stanley Norton
Palo Alto City Hall
Palo Alto, CA 94301

Councilman John Berwald
Palo Alto City Hall
Palo Alto, CA 94301

Councilman Fred Eyerly
Palo Alto City Hall
Palo Alto, CA 94301

Honorable Geraldine Steinberg
Santa Clara County Board of Supervisors
5th District
270 Grant Avenue
Palo Alto, CA 94306

Editor of the Times
245 Lytton Avenue
Palo Alto, CA 94301

July 26, 1976

Mr. Alexander Bodi, Editor
Palo Alto Times
245 Lytton Avenue
Palo Alto, California 94301

Dear Mr. Bodi:

This is to inform your readers about several incorrect statements made in a recent "Letter to the Editor" by Mr. E. D. Lesh of Palo Alto. These statements were in regard to a proposed levee raising project by the Santa Clara Valley Water District on about one third of the levees around the Palo Alto Flood Basin. Mr. Lesh contends that the floods that occurred in 1940, 1955, and 1958 did not reach the Bayshore Freeway and that flooding in the Palo Alto area was caused only by San Francisquito Creek overflows. This is not true. A June, 1956 report by the U. S. Army Corps of Engineers titled "Floods of December, 1955 and January, 1956" documents flooding over Bayshore Highway from overflows out of Matedero Creek as well as San Francisquito Creek.

Mr. Lesh also implies that the Palo Alto Flood Basin can drain faster through the existing tide gates than it can fill up from floodwater. A comprehensive report by the Santa Clara Valley Water District titled "Storage Capability of the Palo Alto Flood Basin", March, 1974, shows that the rate of outflow from the basin is less than the inflow from a 1% flood and lessor floods, and that the top of the levees around the basin should be raised to elevation +7 above mean sea level. The 1% flood is the level of protection that is used by most of the flood control agencies throughout the country, by HUD for their flood insurance program, and by the Santa Clara Valley Water District for the design of flood control projects. The need to raise these low-lying levees was also independently confirmed in a separate report commissioned by the City of Palo Alto titled "Mathematical Model Study of the Palo Alto Flood Basin and Yacht Harbor", March 15, 1975.

Mr. Lesh stated that if the flood waters can't escape in time, a spillway could be built in the basin next to the Palo Alto dump at Mayfield Slough. This alternative was considered by the Water District, along with many others, and found to be unworkable. The highest estimated tide is elevation +6.7 feet above mean sea level. Saltwater would flow back into the basin and cause flooding over Bayshore Freeway.

Of the many alternatives considered by the Water District to solve the flooding problems from the flood basin, the one found to have the least environmental impact and to be the least expensive is to raise the levees. The project proposed by the Water District to raise about one third of the levees around the basin was carefully planned with the City of Palo Alto staff and with a Citizens Study Committee. An Environmental Impact Report was written for the proposed project and a public hearing was held on July 21, 1976. Anyone wishing a copy of the EIR or more information about the project may call the Santa Clara Valley Water District at (408) 265-2600, extension 312.

Sincerely,

Original Signed By

John T. O'Halloran
General Manager

cc: Mr. George A. Sipel, City Manager
City of Palo Alto

B. Wilson
A. Mody

WEST BAYSHORE
RESIDENTS ASSOCIATION

3142 Greer Road
Palo Alto, California 94303

June 25, 1976

Mr. James J. Lenihan
Chairman, Distric Board of Directors
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, California 95118

Dear Mr. Lenihan:

This is to commend you on your Staff's presentation before the City of Palo Alto Planning Commission on June 23rd, on the subject of Flood Control Measures.

As a member of the Citizens Study Group, I presented at that meeting the attached statement and would appreciate assurance that my assumptions are correct,

(1) that the proposed flood control measures on the Palo Alto Flood Basin (Project Number 1039) are part of an "on-going study" of the flood problem effecting our neighborhood area, and

(2) that work on Matadero Creek to eliminate flooding, is under consideration as a next major project, which, however, for financial reasons will not be started until the Flood Basin construction is completed.

Our Residents Association is very concerned about the delay in this project, and also enclosed for your information is a statement of Mrs. Jean Keesey presented at Wednesday's Planning Commission Meeting.

Sincerely yours,

Helene Smith

A. Helene Smith
Chairman

June 18, 1976

To the Members of the Planning Commission:

As a representative of the West Bayshore Residents Association, I have attended several meetings of the Citizens Study Group on the discussions of the most advantages levee construction to finish the Flood Basin Project. I understand that this Project is just a small phase of an ongoing study of the flood problem effecting primarily our neighborhood. We had been assured by both the City Staff and the Santa Clara Valley Water District Staff that this particular phase in question would and could have been completed during 1975, but here we are one year later still discussing the project.

Our neighborhood in the so-called "developed area" needs an efficient flood control, and unless this project is undertaken and finished soon, it may take years to complete at a much higher cost.

I hope the Planning Commission can find a way to speed up this project in the interest of our residents.

Helene Smith
3142 Greer Road

Read at the Planning Commision meeting on June 25, 1976

I have lived in two areas that were completely flooded out with a "oh, we never will have a flood that bad" flood. I know what happens when a city has not prepared for the 100 year flood. I have seen the results and don't want it to happen to my home. I urge the Planning Commision to proceed with due hast and complete this proposed flood control project on the Palo Alto Flood Basin.

I live in the area of Palo Alto that has flooded in the past. My friends live there also. We would like to coninue to live there, without flooding, but will feel safe from future floods only if this project is undertaken. Just three years ago water overflowed Materdero Creek-for over 12 hours-near my home. That is, the water ran over the top of the creek, into a neighbors back yard, thru the front yard and down the street.

I have been on the flood committee for the last three years and hope that this project can become a reality.

Jean Keesey

Jean Keesey
2945 Sandra Place
Palo Alto, California

Board Member of
West Bayshore Residents Assoc.

July 19, 1976

Mrs. A. Helene Smith, Chairman
West Bayshore Residents Association
3142 Greer Road
Palo Alto, California 94303

Dear Mrs. Smith:

Thank you for your letter of June 25, 1976 regarding our proposed flood control measures on the Palo Alto Flood Basin and on Matadero Creek.

Your assumption that the Palo Alto Flood Basin Project is part of an "on-going" study of the flood problems affecting your neighborhood area is correct. We have been working on providing the proper capacity in the basin since the mid-1960s. Previously we have constructed levees around the perimeter of the basin to hold back Bay waters. The presently proposed wall and levees would contain the floodwaters that will be able to reach the basin when all the upstream creek channels have been enlarged to design flood capacity.

Your assumption that Matadero Creek is being considered as a next major project is correct except that it must be considered along with flooding problems of Adobe and Barron Creeks. As you point out, Matadero, Barron and Adobe Creeks between Bayshore Freeway and El Camino Real can cause flooding to the land surrounding these creeks. The flooding from each of these creeks overlaps in the area bounded by Bayshore Freeway and Louis Road, Matadero Creek and Adobe Creek. Therefore, we will study all three creeks, between Bayshore Freeway and Louis Road and present the results of the study in a single report in this current fiscal year.

As to the actual start of construction, we are presently reanalyzing project priorities in the Northwest Zone. Because of the potential for damages, it appears that the construction priority should be advanced over other projects further upstream.

Sincerely yours,

ORIGINAL SIGNED BY

James J. Lenihan, Chairman
Board of Directors

cc: B. Wilson, G. Korbay, J. Richardson

bc: All Board Members, SCVWD

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS
211 MAIN STREET
SAN FRANCISCO, CALIFORNIA 94105

SPNED-E

27 July 1976

Dr. Bernard H. Goldner
Santa Clara Valley
Water District
5750 Almaden Expressway
San Jose, CA 95118

Dear Dr. Goldner:

Reference is made to your letter of 10 June 1976 forwarding the Engineer's Report and Draft Environmental Impact Report on Proposed Flood Control Measures on the Palo Alto Flood Basin.

This office appreciates the opportunity to review your report and our comments are attached.

Sincerely yours,

H. E. PAPE, JR.
Chief, Engineering Division

1 Inclosure
As stated

SAN FRANCISCO DISTRICT COMMENTS
ENGINEER'S REPORT AND DRAFT ENVIRONMENTAL IMPACT REPORT ON PROPOSED FLOOD CONTROL MEASURES ON THE PALO ALTO FLOOD BASIN

1. The San Francisco District, Corps of Engineers presently has a permit application from the Santa Clara Valley Water District for the work that is covered by the EIR. This application was announced in Public Notice 75-336-81, 13 June 1975. The application is being held in abeyance at the request of Santa Clara Valley Water District pending the completion of the EIR.

2. The minimum proposed levee and floodwall design elevation is 7 feet, m.s.l. datum. Should the levees protecting the flood basin from San Francisco Bay fail or be overtopped during the occurrence of a 100-year tide in the Bay, particularly if the levees and floodwall near Bayshore Freeway subside, areas southwest of Bayshore Freeway could be subject to tidal flooding. The value of the 100-year tide which was presented in the Palo Alto Flood Insurance Study, dated May 1973, was 6.7 feet, m.s.l., which was rounded to 7 feet, m.s.l. More recent, conservative estimates of the 100-year tide, based on a more detailed analysis of available records, indicate that an elevation of 7.5 feet m.s.l. could occur. Neither of these elevations, 7 or 7.5 feet, includes any freeboard for wave run-up or levee subsidence. The impacts of the levees (either exterior or interior) being overtopped by, or failing during, the 100-year tide should be presented and discussed in the EIR. The discussion should include the land uses which would be affected by such inundation and the flood depths which could be attained.

3. It is also suggested that the DEIR present and discuss the consequences of flood events which could be expected to occur less frequently than the 100-year event, and the type of land uses affected.

4. The existing levees now serve an important recreational function for the community. People frequently use the levees for walking, hiking, jogging, playing, bird observation, sightseeing and related activities. Any possible effects on these activities should be discussed in depth.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

Santa Clara Valley Water District

5750 ALMADEN EXPRESSWAY
SAN JOSE, CALIFORNIA 95118
TELEPHONE (408) 265-2600

August 24, 1976

Mr. H. E. Pape, Jr., Chief
Engineering Division
U. S. Corps of Engineers
San Francisco District
211 Main Street
San Francisco, California 94105

Dear Mr. Pape:

Thank you for commenting on the Engineer's Report and the draft Environmental Impact Report on the proposed flood control measures on the Palo Alto Flood Basin by your July 27, 1976 letter. Our responses follow:

1. Actually, the City of Palo Alto and not the Water District requested the Corps to hold the permit application in abeyance until the EIR is final. When the final EIR is certified, a copy will be sent to the Corps with a request that the permit be issued.

2. The existing Bayward levees of the Palo Alto Flood Basin were constructed to elevation 9.5 feet. These levees will protect the Flood Basin from saltwater flooding with a freeboard of about 2 feet based on your recent estimate of +7.5 m.s.l. for the "100-year" tide. The hydraulic operation studies of the Flood Basin indicate that for any spill to occur over the proposed levee and the floodwall, a combination of saltwater spills that fill the basin to elevation 5.0 feet and the expected "100-year" flood (freshwater) must occur simultaneously. Based on the historic tide cycles and the expected wave build-up, it does not appear that the volume of saltwater entering the Basin due to the "100-year" tide would exceed 3900 acre feet (water surface elevation 5.0 feet) during the "100-year" flood. Even though the Basin may be capable of containing flood flows due to both saltwater and freshwater inflows, it is beyond the scope of this project to provide flood protection based on simultaneous occurrance of the "100-year" events since they are basically considered to be independent. The completion of the

Flood Basin project does not preclude saltwater flooding due to levee breaks or levee overtopping. The proposed levee raising project is not intended to serve as a "second line of defense" against saltwater flooding. It is important to note that the project, as proposed, is to protect the developed areas southwesterly of Bayshore Freeway from freshwater flooding during the "100-year" flood, based on the seasonal high tides after some of the street crossings on Adobe, Barron and Matadero Creeks (tributaries to the Flood Basin) are upgraded. Any protection to be provided from saltwater flooding will be contingent upon upgrading the Bayfront levee system.

The ground subsidence in the Palo Alto area has been stabilized for the past few years due to the importation of water and a reduction in the pumping from the underground basin. We do not anticipate that the demand from the underground basin will increase to the point where ground subsidence will start again. However, the proposed project does provide a freeboard (about 2.4 feet) to account for the wave build-up and the future subsidence.

3. The existing Flood Basin has the capacity to contain the "50-year" flood with no freeboard. Therefore any flood flow that exceeds the "50-year" flood would spill over Bayshore Freeway and inundate the residential and commercial development southwesterly of the Freeway if the project is not constructed. The depths of flooding will vary from a few inches to about 2-1/2 feet depending upon the magnitude of the flood (up to the "100-year" flood). Additional flooding would occur on the north side of the Flood Basin but it will be limited to undeveloped areas.

4. The proposed project will not adversely affect the many recreational activities that exist today as stated on page 53 of the draft EIR. It will also control vehicular access to the Flood Basin to discourage motorcyclists from riding in the wildlife preserve as desired by the City of Palo Alto.

Our final EIR, when completed, will include your July 27, 1976 letter and our responses. If you wish to discuss any of your comments or our responses in greater detail, please call Mr. Arvind Mody, Project Engineer, at extension 312.

Sincerely yours,

Bruce Wilson

Bruce Wilson
Division Engineer
Design Division

August 3, 1976

TO: Mr. John L. O'Halloran
General Manager
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

Mr. Jim Lenihan
Santa Clara Valley Water District
330 Distel Circle
Los Altos, CA 94022

Mayor Stanley Norton
Palo Alto City Hall
Palo Alto, CA 94301

Editor of the Times
245 Lytton Avenue
Palo Alto, CA 94301

If Mr. J. T. O'Halloran will re-read my letter of July 22, concerning the flood of 1955, he will notice it says the Bayshore Highway was NOT flooded in the area where he wants to build a levee and wall. The flooding was at San Francisquito Creek and Bayshore.

I was unable to obtain a copy of the U.S. Army Corps of Engineers report; however, I did read some copies of the Palo Alto Times reporting the flood. According to the Times (12/23/55) the San Francisquito Creek overflowed at about 1905 Edgewood. The water flowed down Greer Road to Colorado Avenue where the levees for Matadero Creek stopped the water. The Times reported a small break in the levee at Matadero Creek that was stopped up within minutes. Any flooding south of Matadero was caused by the inability of the storm drains to drain into the creek. This is one reason why we should try to keep the water as low as possible in the flood basin and in the creeks.

Mr. Jerry Keithley, the City Manager at that time, reported (12/27/55) that the flood basin was in good shape. He said men were kept at the tide gates to clean out the debris. The Times also reported that Matadero and Adobe creeks rose again two days later but were no threat.

Mark Nesbit, Harbormaster at the Palo Alto Yacht Harbor reported (12/26/55) a high tide of 6'6", and a few days later, a tide of 6'9". Before 1940 the flood basin was open to the tide. There were many times the tides were higher than 6'6". They were never up to the Bayshore Highway.

I am convinced that the engineers available to the Santa Clara Valley Water District could design a tide gate that would drain the flood basin.

Edward D. Lesh
Edward D. Lesh
2845 Waverley Street
Palo Alto, CA 94306

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

Santa Clara Valley Water District

5750 ALMADEN EXPRESSWAY
SAN JOSE, CALIFORNIA 95118
TELEPHONE (408) 265-2600

September 2, 1976

Mr. Edward D. Lesh
2845 Waverly Street
Palo Alto, California 94306

Dear Mr. Lesh:

It seems from your August 3 letter and your past correspondence to this District and to the Palo Alto Times that you continue to be concerned about two basic points involving our Palo Alto Flood Basin levee raising project. The points are: did flooding really take place over Bayshore Freeway in the vicinity of the Palo Alto Flood Basin during the 1955 flood, and why can't we save a lot of money by putting a spillway or more flood gates in the basin levees instead of raising the levees.

In regard to the first point about flooding over Bayshore Freeway, I have enclosed copies of pages 74, 75, and 76 from the Corps of Engineer's report on "Floods of December 1955 and January 1976 in Northern California Coastal Streams". The report says that flooding did occur over "Bayshore Highway" from Adobe and Matadero Creeks. As you know, Adobe and Matadero Creeks drain into the Palo Alto Flood Basin.

In regard to the second point about using a spillway or more flood gates, I can assure you that these alternatives were considered by my engineering staff and found to be unworkable. Over the years the land around the South Bay has dropped in elevation because water was pumped out of the ground for so many years. This is why in years past when ground elevations were higher, high tides did not reach Bayshore Freeway as stated in your letter. Because of the past subsidence, Bayshore Freeway opposite the flood basin is now at an elevation of only about 3.2 feet above mean sea level. As you stated in your August 3, 1976 letter, a tide of 6'9" hit the Palo Alto Yacht Harbor a few days after Christmas, 1955. With the elevation of Bayshore Freeway at +3.2 and a tide of +6 or higher you can see that a spillway or uncontrolled opening in the basin levee could allow Bay water to fill the basin and flood over Bayshore Freeway. This could happen even when there is no runoff in the creeks from rain. Incidentally, because of decreased groundwater extraction, there has been no subsidence since the late 1960s.

AN AFFIRMATIVE ACTION EMPLOYER

The alternative of using more flood gates as you suggest also received careful consideration. In 1964 and again in 1974 the District's engineers studied the addition of more flood gates. There are 16 flood gates now. We found that if we installed as many as another 100 flood gates, the depth of the water in the flood basin would be lowered by only a few inches. When the tide rises and heavy flows from the creeks enter the basin, the water cannot drain out of the basin until the tide is lower than the level of the water in the basin. When the water in the basin rises higher than the tide, the water starts to drain out. The outflow from the basin starts very slowly then picks up speed but before the basin drains out, the tide starts coming back in. It is essential that the flood basin have enough storage volume to contain the excess inflows from the three creeks. You are absolutely right in stating in your letter that we should try to keep the water as low as possible in the flood basin and in the creeks but the level cannot be made lower by adding gates or a spillway.

If you are still not convinced that more tide gates simply will not do the job, I invite you to come into our office and talk with our engineers. You may call Mr. Bruce Wilson who is in charge of our Design Division or Mr. Arvin Mody, our Project Engineer for the Palo Alto Flood Basin levee raising project.

Very truly yours,

John T. O'Halloran
General Manager

Attachments

Table 35

Summary of Damages (Floods of December 1955)
San Francisquito Creek Basin

Item	Damage		
	Direct	Indirect	Total
Residential	$ 1,449,800	$ 66,700	$ 1,516,500
Non-residential	117,100	8,500	125,600
Highways, roads, and bridges	31,400	-	31,400
Emergency aid	220,500	-	220,500
Total	$ 1,818,800	$ 75,200	$ 1,894,000

MATADERO CREEK BASIN (Area 3)

182. Basin description. Matadero Creek drains approximately 8 square miles of mountainous area and 6 square miles of valley land in northern Santa Clara County from approximately one mile above Atascadero Road to the Matadero-Adobe Creek flood basin. Matadero Creek and its tributary streams, including Los Robles Creek on the south and Frenchman's Creek, locally known as Dartmouth Canal, drain the central portion of the Stanford University Campus, the Stanford Industrial Research area, and the adjacent foothills. The creek meanders through the city of Palo Alto collecting inflow from the city's storm drainage system.

183. Storm rainfall and stages. During the storm period 15 - 28 December 1955, rainfall reports indicate the most intense period of rainfall occurred during the period 18 - 20 December and 22 - 24 December 1955. The rainfall in this basin was similar to that recorded for the San Francisquito Creek drainage basin. The peak discharge recorded by the U.S.G.S. was 854 cubic feet per second. It is believed that the December 1955 flood is among the greatest of record.

184. Description of the flood. Between 11:00 P.M. and midnight 22 December 1955, culverts in the vicinity of the Stanford University Campus and the western city limits of Palo Alto poured water into the city streets, flooding Highway U. S. 101 and inundating the Mayfield School. The total area flooded was 102 acres of residential and commercial property. Overflow waters did little damage in homes. A materials company suffered damage to motors and pumps. Debris-laden

overflow waters poured through a large warehouse area, depositing tons of silt and debris. The overflow rejoined the creek in the vicinity of the Southern Pacific Railroad. At its crest, the flood water was 3 inches above the Bayshore Highway pavement. The receding flood waters revealed that creek banks had been eroded and degradation of the channel bottom had resulted in the channel being enlarged by 20 to 30 percent.

185. Summary of losses. The major portion of the damages sustained were to the commercial area and to city streets as a result of silt and debris deposits. Damages are summarized in Table 36.

Table 36

Summary of Damages (Floods of December 1955)
Matadero Creek Basin

Item	Damage		
	Direct	Indirect	Total
Residential	$ 9,700	$ 200	$ 9,900
Non-residential	19,300	1,500	20,800
Bank erosion	13,000	-	13,000
Emergency aid	24,400	-	24,400
Total	$ 66,400	$ 1,700	$ 68,100

ADOBE CREEK BASIN (Area 3)

186. Basin descripition. Adobe Creek drains an area of approximately 9 square miles in northern Santa Clara County from Monte Bello Ridge and Page Mill Road in the Santa Cruz Mountains to the Matadero-Adobe flood basin. The creek meanders through Green Meadow Tract, Fairmeadow Tract, and Mayview Homesites in the southeastern section of the city of Palo Alto, and collects the inflow from the storm drainage systems of the subdivisions bordering the creek.

187. Storm rainfall and stages. During the storm period 15 - 28 December 1955, rainfall reports indicate the most intense period of rainfall occurred during the period 18 - 20 December and 22 - 24 December 1955. Rainfall in this basin was similar to that recorded for the San Francisquito Creek drainage basin. To date, the peak discharge for this storm has not been reported. It is believed, however, that the December 1955 runoff is among the greatest of record.

188. Description of the flood. Between 11:00 P.M. and midnight 22 December 1955, culverts were overflowed due to their inability to pass discharges for a storm of this magnitude, thus causing the flood waters to overflow Highway U. S. 101 with resultant flooding of 73 acres of residential property and 45 acres of agricultural land, for a total flood plain of 118 acres. The accumulated water impounded behind Highway U. S. 101 resulted in the major portion of the damages sustained in this area. Serious bank erosion and the cutting of a new channel in the foothill area above elevation 200 resulted in large damages claimed for a limited number of residences.

189. Summary of losses. The major portion of the damage sustained was to residences and was attributable to bank erosion and the formation of a new stream channel. Damages are summarized in Table 37.

Table 37

Summary of Damages (Flood of December 1955)
Adobe Creek Basin

Item	Damage		
	Direct	Indirect	Total
Agricultural	$ 15,000	$ -	$ 15,000
Residential	70,500	400	70,900
Non-residential	900	-	900
Total	$ 86,400	$ 400	$ 86,800

PERMANENTE CREEK BASIN (Area 3)

190. Basin description. Permanente Creek originates high in the Santa Cruz Mountains between Saratoga and Los Altos. It drains an area of approximately 16 square miles and the basin topography varies from mountainous in the upper reaches to flatlands in the lower reaches of the stream. Its course is generally in a northward direction, meandering through the city of Mountain View and emptying into San Francisco Bay almost due north of Mountain View. In its middle and lower reaches the basin is densely settled, containing portions of the cities of Los Altos and Mountain View, and a number of suburban developments. Agricultural areas are intensively farmed and include a large number of apricot, prune, and pear orchards. The basin is adequately served by Federal, State, and County highways and a branch railroad line of the Southern Pacific Company.

APPENDIX E

APPENDIX E

SANTA CLARA VALLEY WATER DISTRICT

STORAGE CAPABILITY OF THE PALO ALTO FLOOD BASIN

by

Arvind P. Mody
Associate Civil Engineer

under the direction of

Edwin E. Ferguson
Head, Design Branch

Bruce Wilson
Division Engineer
Design Division

George S. Korbay
Design and Construction Manager

March 1974

John T. O'Halloran
General Manager

Lloyd C. Fowler
Chief Engineer

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INTRODUCTION

Matadero, Adobe and Barron Creeks traverse the City of Palo Alto and furnish outfalls for city storm drainage systems. These creeks historically discharged directly into San Francisco Bay through Mayfield and Charleston Sloughs. As subsidence occurred a levee system was constructed to prevent saltwater flooding from the Bay. The levees created a flood basin, later named the Palo Alto Flood Basin, into which Matadero, Adobe and Barron Creeks discharged. The Basin, which contains approximately 600 acres, is shown on the map on plate 1. A tide gate system was constructed in 1956 to discharge floodwaters from the Basin to the Bay. As subsidence continued the levee system around the Basin and along Matadero, Adobe and Barron Creeks was now no longer adequate to prevent flooding of the existing residential, commercial and industrial development southwesterly of Bayshore Freeway.

In 1964 a report titled "Report on Outfall Channels for Matadero, Adobe, and Barron Creeks" was completed which presented two possible alternative solutions to the flooding problems along the outfall channels of Matadero, Adobe, and Barron Creeks. The first of these was to refine the existing Flood Basin to provide storage of upstream runoff during rising and high tide for discharge during the falling and low portions of the tide cycle. The second alternative investigated was the use of high leveed channels open directly to San Francisco Bay without benefit of a storage basin or tide gates.

The use of a Flood Basin to store peak runoff for later release to the Bay during periods of low tide was selected to provide the needed flood protection. This provides a lower water surface elevation in the upstream channels with lower levees to provide the necessary flood control protection. The lower water surface elevation also is a direct benefit in that less pumping is required to get local drainage (storm sewer) water into the flood control channels.

The Flood Basin as originally designed required that 440 acres be excavated to an elevation of at least -3.5 feet. Material excavated from the Basin was to be placed on approximately ± 100 acres of land within the Basin adjacent to Bayshore Freeway for potential commercial or industrial development.

Construction was started in 1968 on the flood control improvements and continued as funds were available for construction. The first stage construction was completed in 1970 when the perimeter levees were constructed from Bayshore Freeway on the Adobe-Barron Creek side to a point approximately 1900 feet north of Bayshore Freeway on the Matadero Creek side. The second stage construction was completed in 1972 when flood walls and levees were constructed on Matadero Creek. A third stage will be constructed in the spring of 1974 when the levees on Adobe and Barron Creeks are raised.

The fourth stage is scheduled for completion starting in 1974 and will consist of completing the perimeter levee system. A levee will be constructed along Matadero Creek from the south end of the previously constructed levee to Bayshore Freeway. A levee will also be constructed along the Bayshore Freeway Frontage road from Adobe-Barron creeks to Matadero Creek. A final stage of construction as originally conceived would have been to excavate the 440-acre portion of the Basin and to fill the ±100-acre portion along Bayshore Freeway.

Now that the City of Palo Alto, as part of its General Plan, Open Space Element, has designated the entire 600-acre Flood Basin as a Wetland Preserve,(1) it is desirable to reevaluate the need for the final stage, excavation of the Basin.

---

(1) See Pages E-14 and E-15

Objective

The objective of this study is to determine if the Palo Alto Flood Basin will provide flood control protection to existing residential, commercial and industrial development if the entire ±600 acre Basin is available for flood storage. The desires of the community to preserve the area within the Basin as a "Wetland Preserve" will be served if no further excavation is required to provide flood control protection.

Design Criteria

In order to determine the existing storing capacity of the Basin the following design criteria were used:

Storage-Elevation Curve - A storage versus elevation curve for the Basin shown on Plate 2, was developed from survey data obtained in October 1972. Plate 2 also notes the elevations of the low points on the existing Basin levees.

Inflow Hydrograph - The 100-year frequency inflow hydrograph which represents inflow into the Basin from Matadero, Adobe, and Barron Creeks is shown on Plate 3. The peak flow rate of 5050 cubic feet per second was obtained by a regional flood frequency method of analysis. The shape of the hydrograph was developed using a Army Corps of Engineers' computer program, titled "Flood Hydrograph".

Tide Cycle - The average four day winter tide cycle was developed by analyzing winter tides recorded at South Bay No. 1 tide gage for the months of December, January, and February during 1967 through 1972. This tide cycle was corrected to reflect the tide cycle near Palo Alto by using the Army Corps of Engineers' "Tidal Reference Planes" Chart. The resulting tide cycle as shown on Plate 4, was used in conjunction with the inflow hydrograph to establish the most critical combination of hydrologic events. It should be noted that at low tide periods large volumes of flood water will be released to the Bay, whereas at high tide periods large volumes of flood flows will be stored for later release at the next low tide period. It is evident therefore, that the most severe condition for storing the maximum volume of flood water would have to be determined from several combinations of the time of the peak flow and the tidal cycle. This critical condition would then be considered as the final design criterion.

Design Assumptions

The assumptions made in determining the maximum Basin storage capacity and the time required to empty the Basin are as follows:

1. The 16 automatic tide gates (Armco 60" x 60" Model 107) constructed in 1956 would discharge flood flows efficiently into the Bay. The flap gates will open automatically when the water surface elevation in the Basin is higher than the tidal elevation of the Bay, and will close automatically when the Basin water surface elevation is below the tide elevation.

2. The coefficients of discharge are considered constant irrespective of the change in head. The values used for these coefficients are 2.90 for open channel flow and 0.50 for orifice

flow.

3. The given tide cycle of 75 hours would occur twice in succession in order to determine the time required to reduce the Basin storage to a level which would provide sufficient capacity for subsequent flood flows.

Method of Analysis

A computer program was developed to assist in determining the relationship between storage volume, pool elevation, and discharge through the tide gates against the tide cycle. The program was designed to first compute the discharge through the 16 existing tide gates for six minute time increments using hydraulic theories (open channel flow or orifice flow). This discharge volume was then subtracted from the inflow volume and the difference was added to or subtracted from the volume previously stored in the Basin. This process was repeated for each time interval until the design flood had been discharged from the Basin. The water surface elevation corresponding to the maximum storage is the design elevation for the Basin. The most critical condition of the storage volume in the Basin occurred when the peak inflow of a 100-year flood was coincident with the time that the rising tide was at mean sea level (see Point "A" on Plate 4). Moreover, two initial storage conditions were used in this study and for each condition the 100-year design flood was routed through the Basin and the maximum Basin pool elevations were determined. These initial storage conditions are:

1. Initial pool elevation at -4.80 feet which is the condition that would exist if a flood were to occur when the basin is empty.

2. Initial pool elevation of +4.60 feet which is the condition that would exist if a subsequent flood were to occur immediately following the 100-year design flood.

The purpose for testing these two extreme initial storage conditions was to study the effects on the maximum Basin pool elevations when a subsequent 100-year design flood enters the Basin. Although the chance of having two 100-year floods in quick succession is extremely remote, a lower magnitude flood could occur immediately before or after the design flood, resulting in possible flooding outside of the Basin. Hence it is necessary to determine how soon the flood flows can be discharged into the Bay thereby making sufficient storage available for the subsequent floods. By considering these two 100-year floods in succession, for the condition where the Basin levees are constructed to the design height, the Basin will be able to store flood flows due to any other combination of hydrologic events which are smaller in magnitude.

ENGINEERING EVALUATION OF FLOOD BASIN

The use of a flood basin to store peak runoff for later release to the Bay during periods of low tides allows a lower water surface elevation and therefore lower levees on the upstream channels to provide the necessary flood capacity. This in turn requires less pumping of local drainage water into the flood control channels.

A careful analysis of the effects of time of occurrence and magnitude of the 100-year flood, demonstrated that the most critical condition occurred when the peak flow of a 100-year flood coincided with the time of occurrence of mean sea level on the rising tide of the design tidal cycle. A composite flood hydrograph for the three streams was used as the inflow flood to the Basin. It was also found that the most critical condition existed when a tide peak occurred 4 hours after the inflow peak. The tidal cycle is shown on Plate 4 and the inflow hydrograph of the composite 100-year flood is shown on Plates 3 and 5.

A comparison was made between the maximum Basin storage elevations as obtained by considering the two initial Basin pool elevations. It was found that the maximum pool elevation is +4.60 feet when the 100-year flood is routed through the Basin with the initial pool elevation at -4.80 feet. The maximum pool elevation is +5.96 feet when a subsequent 100-year flood is routed through the Basin immediately following the first flood event.

In this case the initial pool elevation is +4.60.

Study Results

The existing Flood Basin has a limited storage capacity defined by the topography and the area of the Basin. The maximum storage elevation of the Basin was determined (Plate 5) using the initial storage elevation of -4.8 and the existing tidal gates. The storage volume corresponding to this elevation (+4.60) is 3,596 acre feet. It can be seen from Plates 2, 6, and 7 that in order to store 3,596 acre feet of water, portions of levees surrounding the Basin would have to be raised to a minimum elevation +7.0 including 2.4 feet of freeboard to account for wave action and future subsidence. Additional levee height will be required to account for future levee consolidation. This additional height will vary from 0 to 1 foot depending upon the type of material used to construct the levees (zero for imported material, 1 foot for material excavated from the Basin floor). Furthermore, the results show that the Basin storage depth will be increased by 1.3 feet if the effective initial storage elevation is +4.60 just prior to the occurrence of another 100-year design flood.

CONCLUSIONS

The following conclusions are derived from the information gathered and computations made during the course of the investigation described in this report.

1. No further excavation of the floor of the Basin is required if the entire area of 600 acres is available for storage of flood waters.

2. A perimeter levee system around the Basin should be completed by constructing a levee along the Bayshore Frontage Road from Adobe Creek to the City of Palo Alto Municipal Services Center, and around the Municipal Services Center to Matadero Creek. The existing levee on the west side of the Basin should be raised and strengthened from Bayshore Freeway north to the end of the previously constructed levee. The levee should be constructed to elevation +7.0 if imported fill material is used. This includes 2.4 feet of freeboard for wave action and possible future subsidence. If the fill material is obtained by excavation on the Basin floor, then the levees should be raised to elevation +8.0 to account for an additional 1 foot for levee consolidation. The total construction cost is estimated to be $300,000.

RECOMMENDATIONS

The Flood Basin, with raised levees, is an economical and effective means of protecting adjacent areas from flooding. It requires construction of lower levees along Adobe, Barron, and

Matadero Creeks upstream of Bayshore Freeway. Besides offering flood protection, it provides an attractive site for the conservation of wildlife and its natural habitat.

It is therefore recommended that the levees, as shown on Plates 6 and 7, be constructed to elevation +7.0 using imported fill material to provide flood protection to the residential, commercial, and industrial development southerly of Bayshore Freeway.

City of Palo Alto
CALIFORNIA
94301

February 9, 1973

PLANNING COMMISSION
Palo Alto, California

Resolution Concerning the Baylands Plan

Members of the Commission:

Attached for your consideration is a Resolution including four recommended actions: 1) rescinding the Three-Finger Lake Plan; 2) designating the Flood Basin as a Wetland Preserve; 3) designating the City-owned lands in San Mateo County as a Marshland Preserve; 4) establishing a Baylands Plant Zone Map.

Also attached is an environmental assessment of the proposed action. Detailed background on these proposals was presented to the Commission on January 17, 1973.

Respectfully submitted,

NAPHTALI H. KNOX
Planning Director

Att.

Flood Basin:*

The 600-acre Flood Basin has been designated as a Wetland Preserve. Its primary use is as a flood control facility, but its use as a wetland and wildlife habitat sanctuary is of major importance. It is one of the few remnants left of relatively undisturbed wetland in the Bay Area. Recreation uses here must be compatible with these two major uses and may include hiking, nature walks, and retriever dog training in limited areas. The present plant community provides a permanent habitat and nesting area for several species of waterfowl, shore birds, and mammals; and wintering or resting grounds for many migratory waterfowl and shorebird species which complement the adjoining tidal marsh plant community. The Flood Basin will be enhanced as a wildlife preserve by selective dredging to create island sanctuaries and mounds and by the introduction of compatible salt-tolerant plants to increase the habitat diversity and food supply and variety. This will allow greater use of the wetlands by each species and encourage other species to inhabit the basin.

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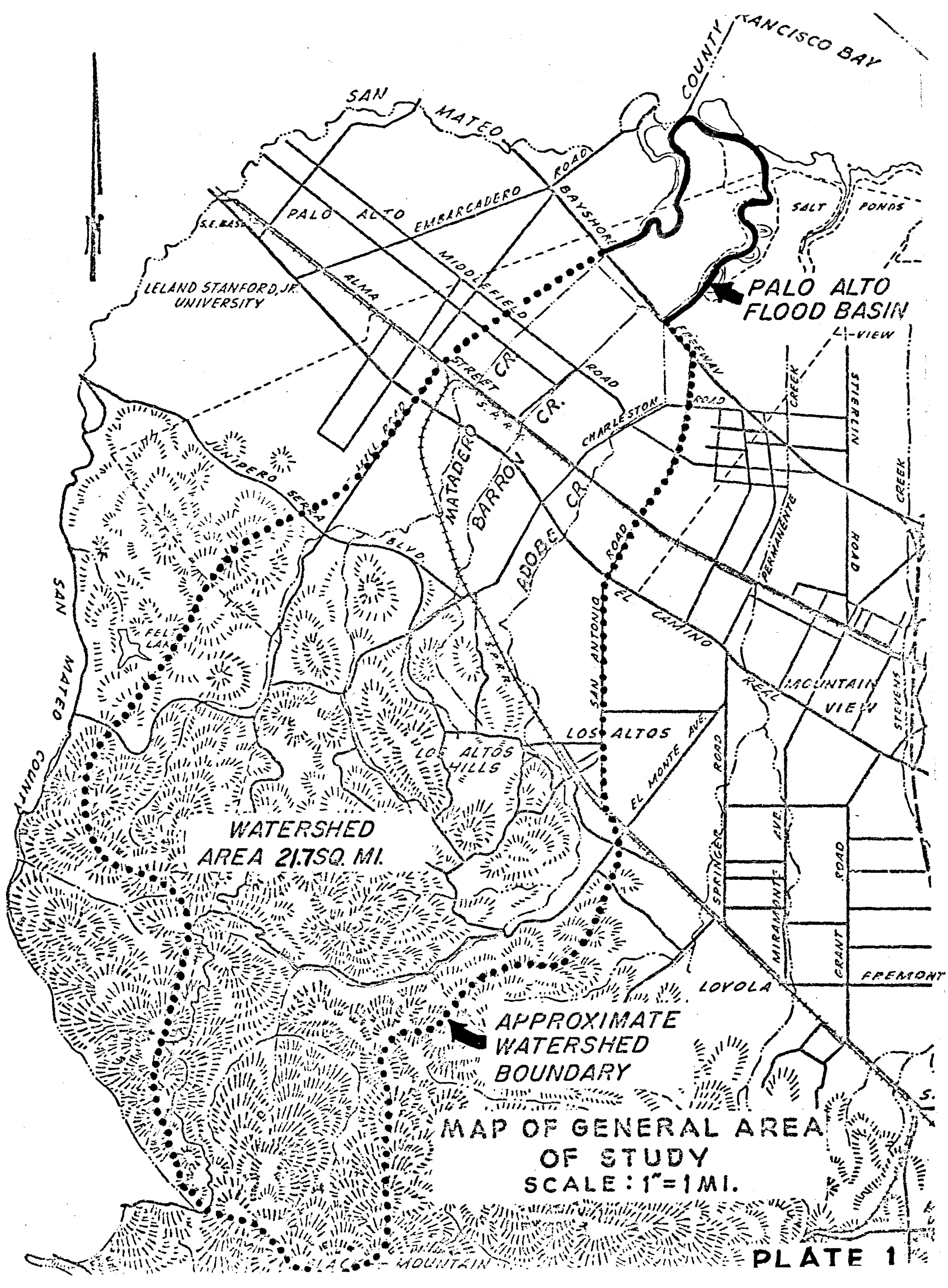
* City of Palo Alto, Open Space Element of the Palo Alto General Plan, revised on April 23, 1973, Page B-5.

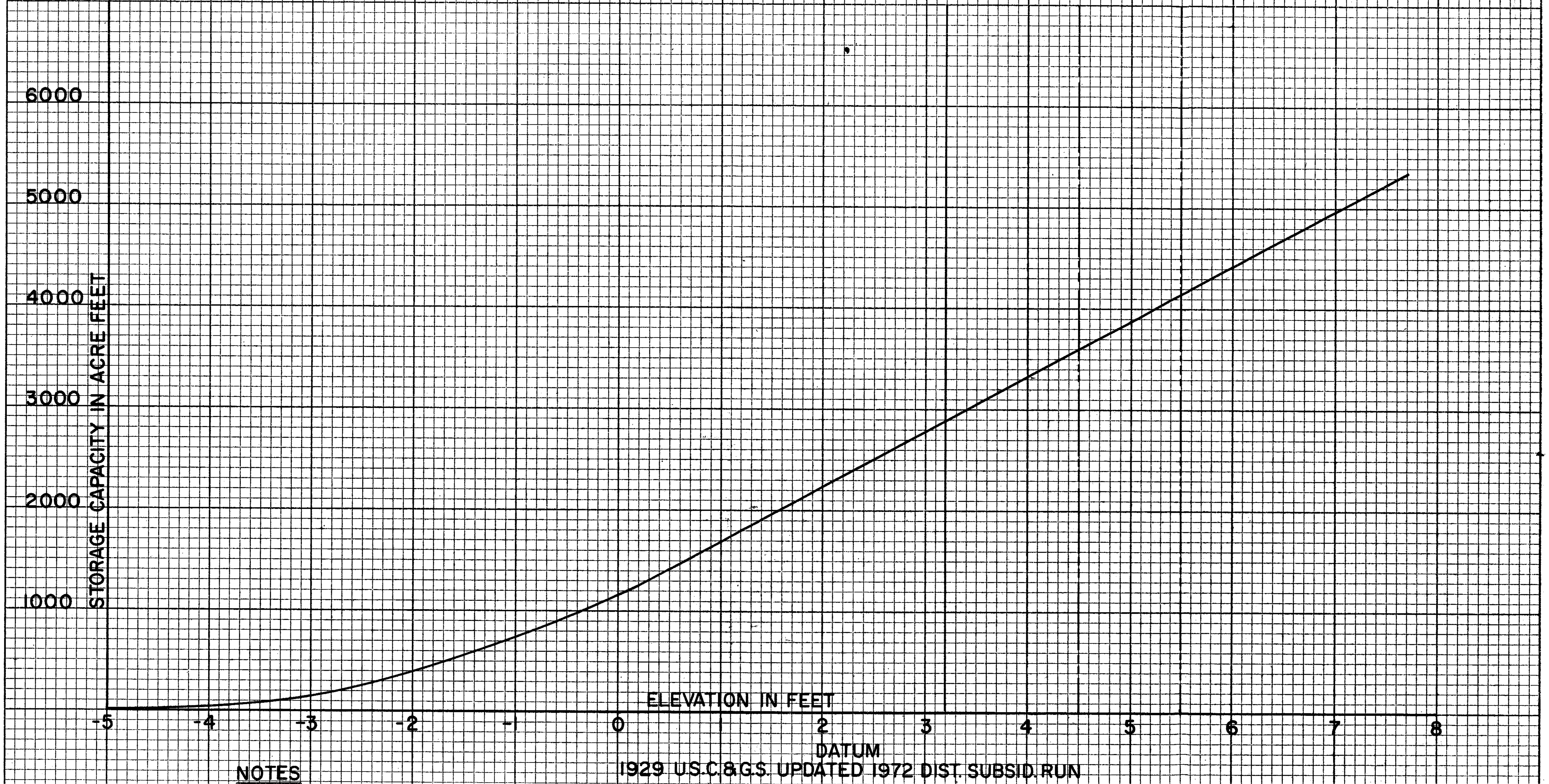


MAP OF GENERAL AREA OF STUDY

SCALE: 1"=1 MI.

PLATE 1

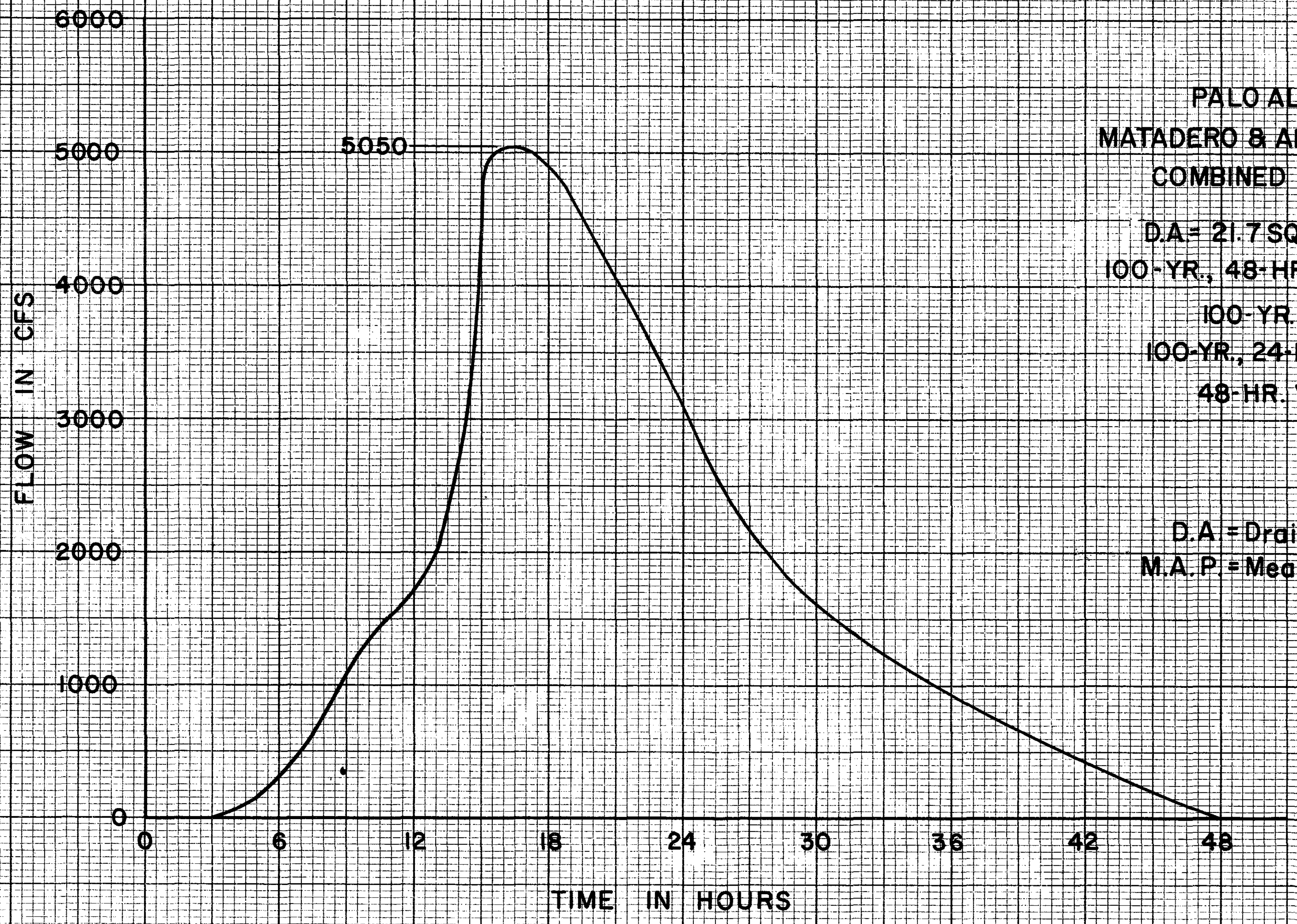
PALO ALTO FLOOD BASIN
ELEVATION STORAGE CURVE



NOTES

ELEVATION OF LOW POINT OF CURB ON BAYSHORE FRONTAGE ROAD +3.2
ELEVATION OF LOW POINT MATADERO LEVEE +4.0
ELEVATION OF LOW POINT OF CITY OF PALO ALTO STORAGE AREA +4.5
ELEVATION OF CITY OF PALO ALTO BUILDING PAD AREA +5.5
ELEVATION OF BOTTOM OF TIDE GATE -4.85

PLATE 2

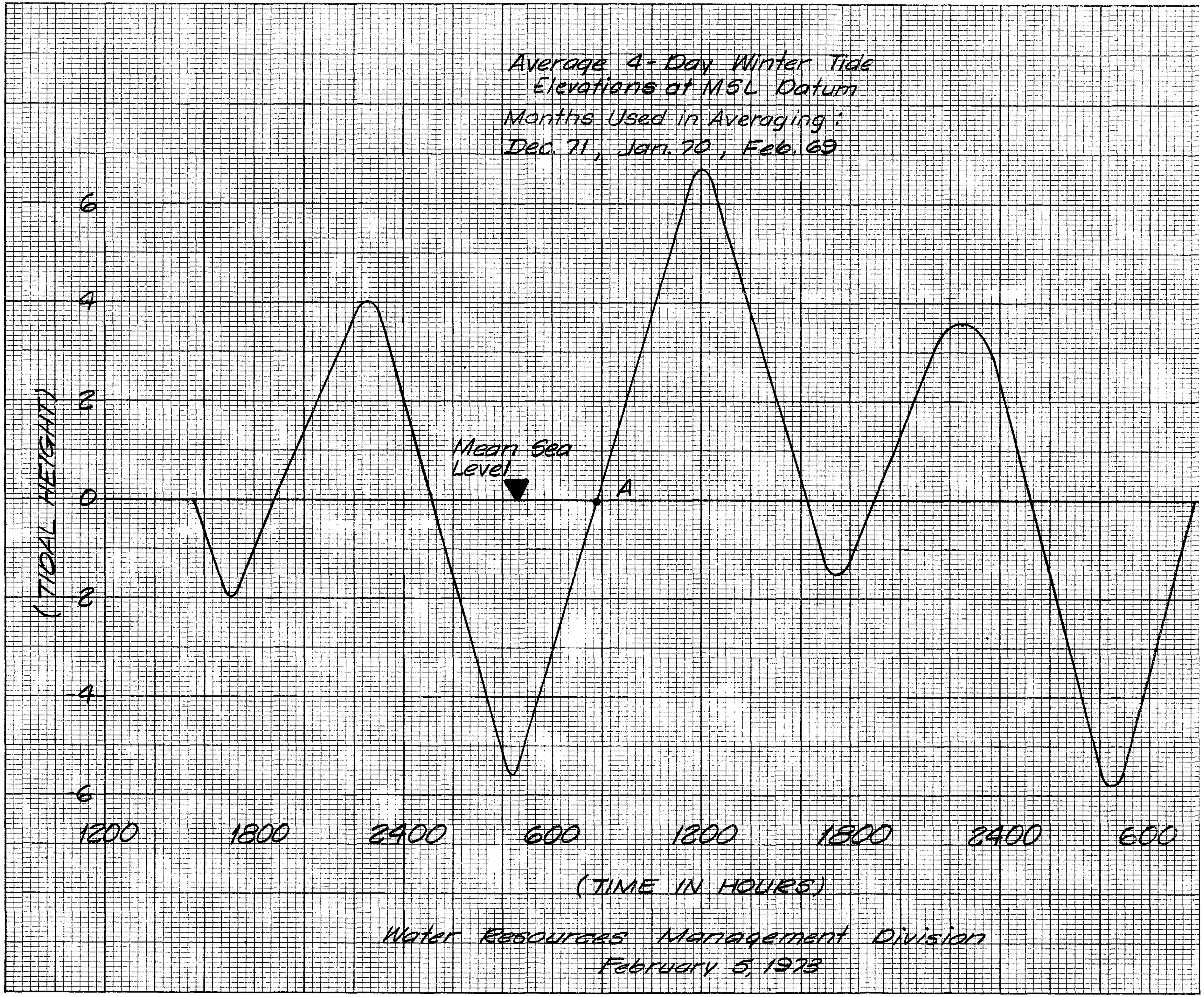


PALO ALTO FLOOD BASIN
MATADERO & ADOBE & BARRON CREEKS
COMBINED FLOOD HYDROGRAPH

D.A.= 21.7 SQ. MI. M.A.P.=20.2 IN.
100-YR., 48-HR. FLOOD HYDROGRAPH
100-YR. PEAK 5050 CFS
100-YR., 24-HR. VOLUME 4400 AF.
48-HR. VOLUME 6575 AF.

D.A.=Drainage Area
M.A.P.=Mean Annual Precipitation

PLATE 3

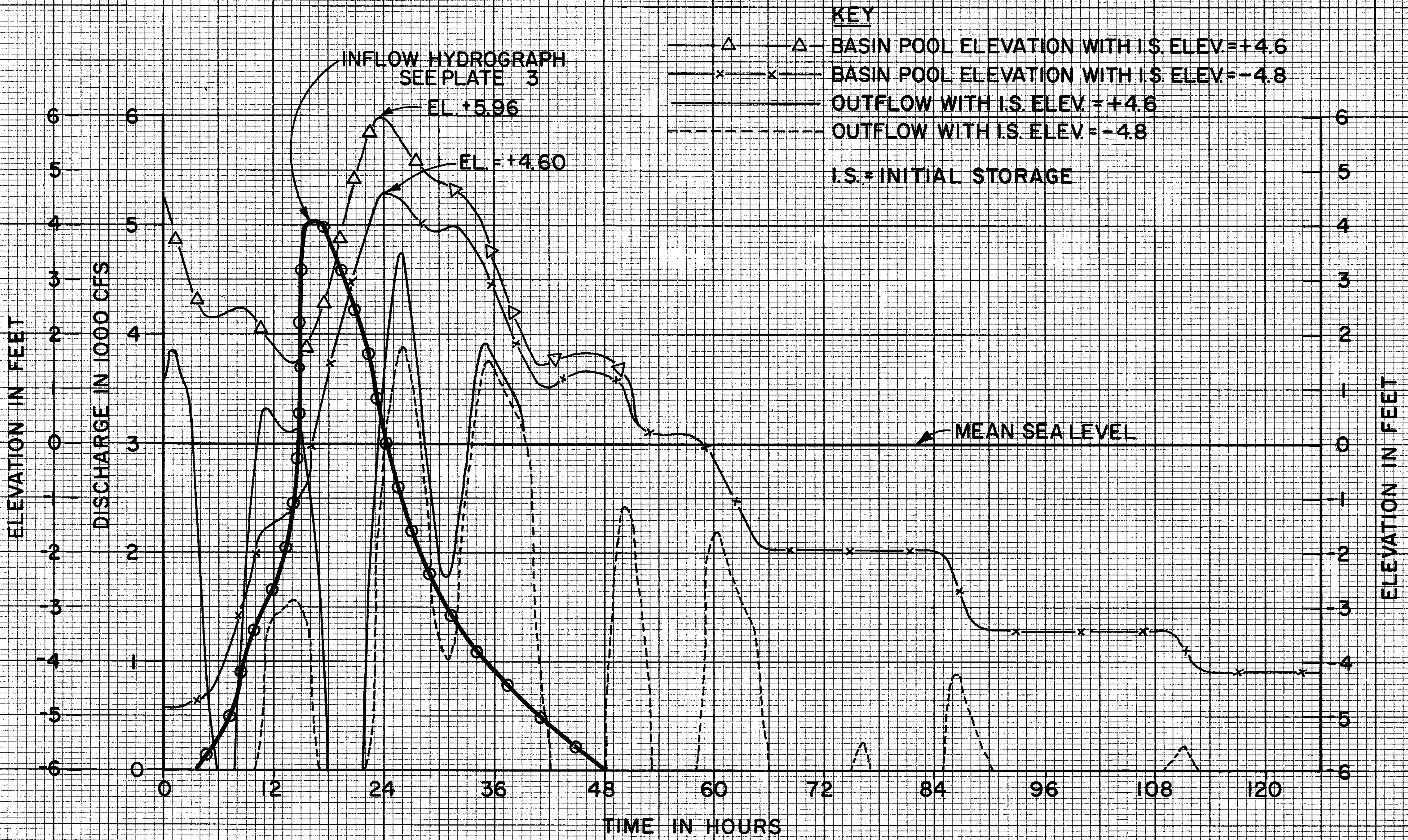


Average 4-Day Winter Tide Elevations at MSL Datum

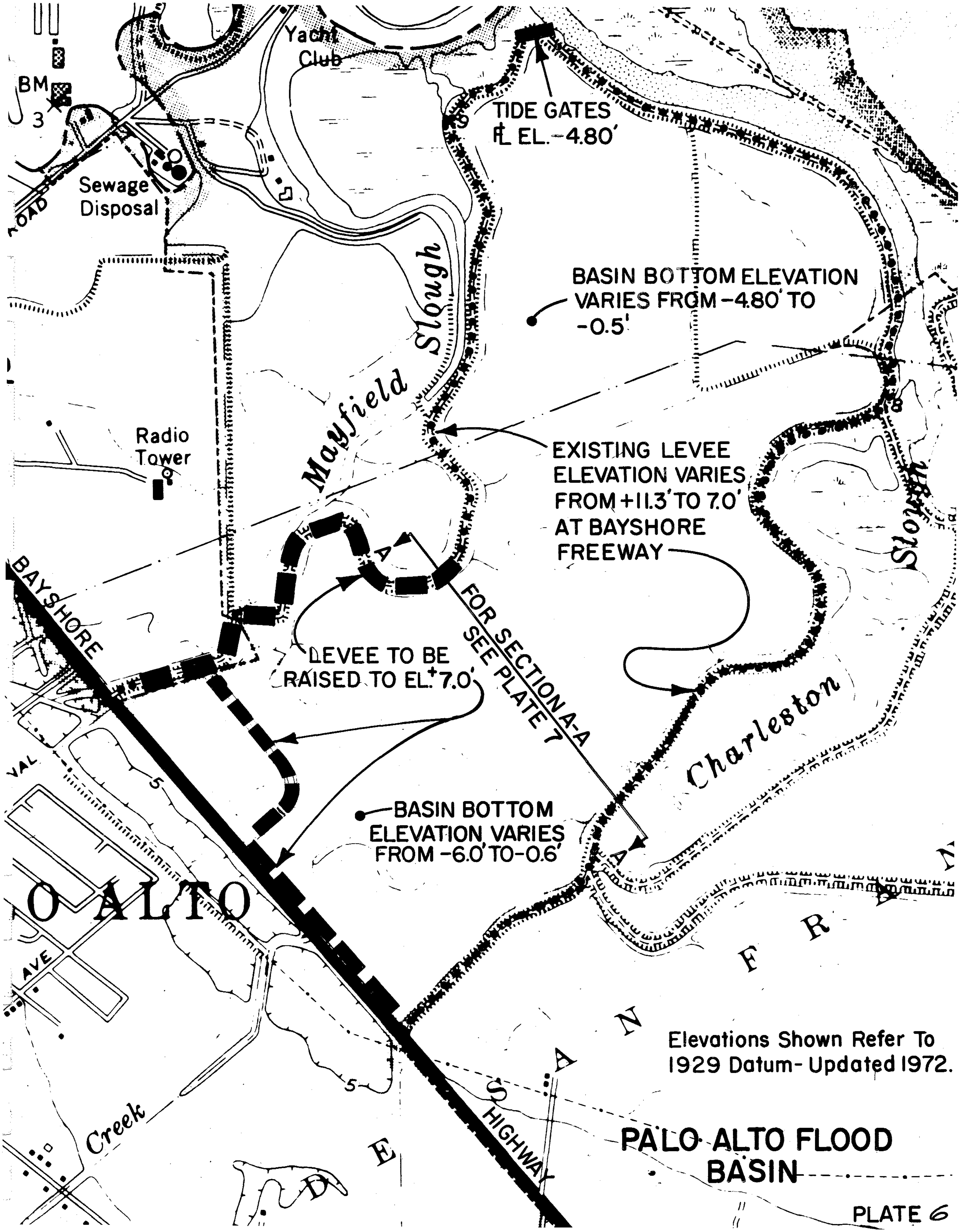
Months Used in Averaging:
Dec. 71, Jan. 70, Feb. 69

Water Resources Management Division
February 5, 1973

Plate 4

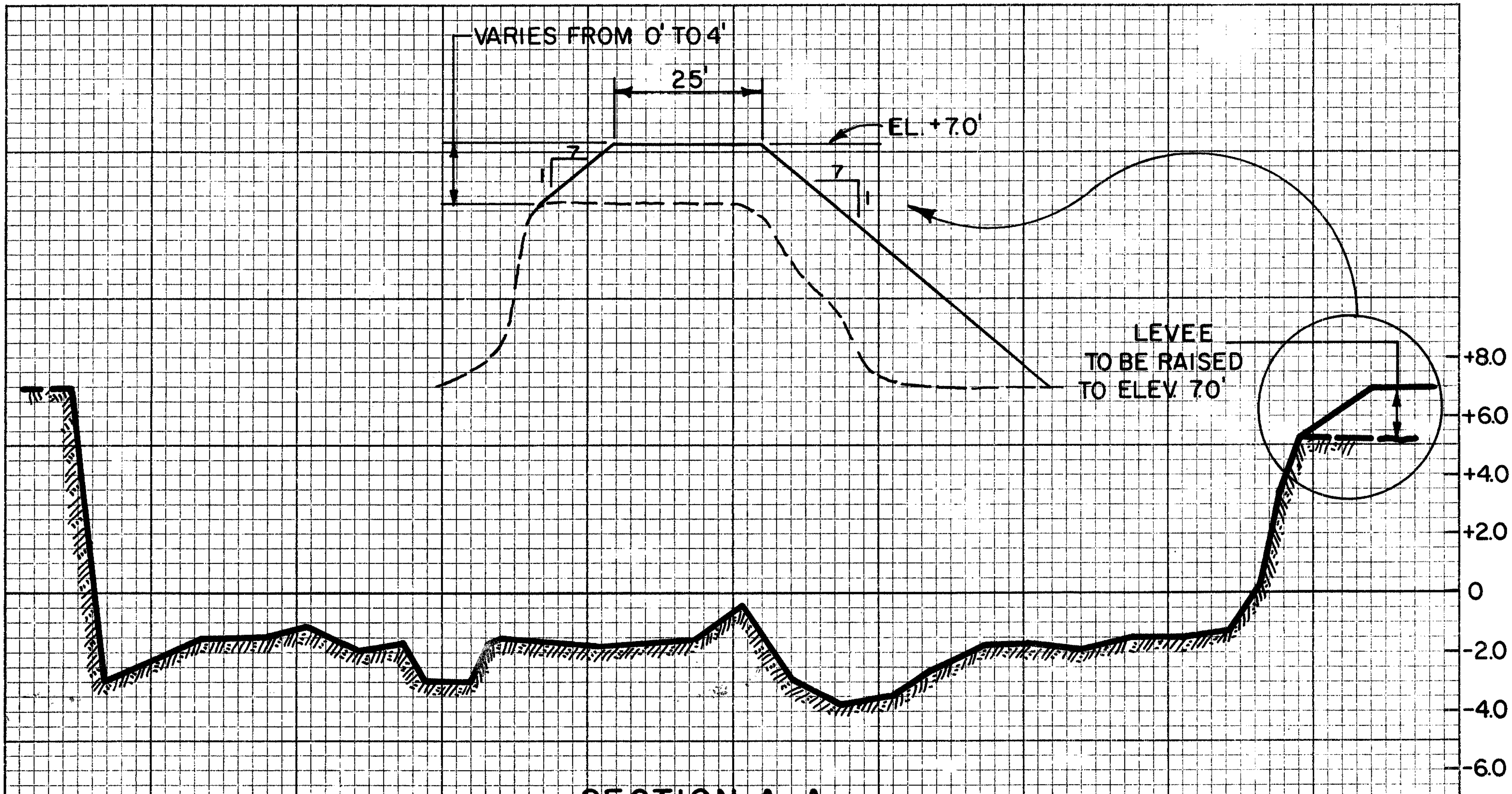


TWO CONDITIONS OF FLOOD BASIN OPERATION WITH INFLOW PEAK MATCHING
MEAN SEA LEVEL ON THE RISING TIDE (Point "A" Plate 4)


Yacht Club
BM 3
Sewage Disposal
ROAD
TIDE GATES
℄ EL. -4.80'
BASIN BOTTOM ELEVATION VARIES FROM -4.80' TO -0.5'
Mayfield Slough
Radio Tower
EXISTING LEVEE ELEVATION VARIES FROM +11.3' TO 7.0' AT BAYSHORE FREEWAY
Slough
A
FOR SECTION A-A SEE PLATE 7
BAYSHORE
LEVEE TO BE RAISED TO EL. +7.0'
Charleston
VAL
5
BASIN BOTTOM ELEVATION VARIES FROM -6.0' TO -0.6'
O ALTO
AVE
S A N F R A N
Creek
HIGHWAY
D E
Elevations Shown Refer To 1929 Datum- Updated 1972.

PALO ALTO FLOOD BASIN

PLATE 6



SECTION A-A
(From Plate 6)

PALO ALTO FLOOD BASIN

SCALE: HOR. 1" = 100'
VERT. 1" = 5'